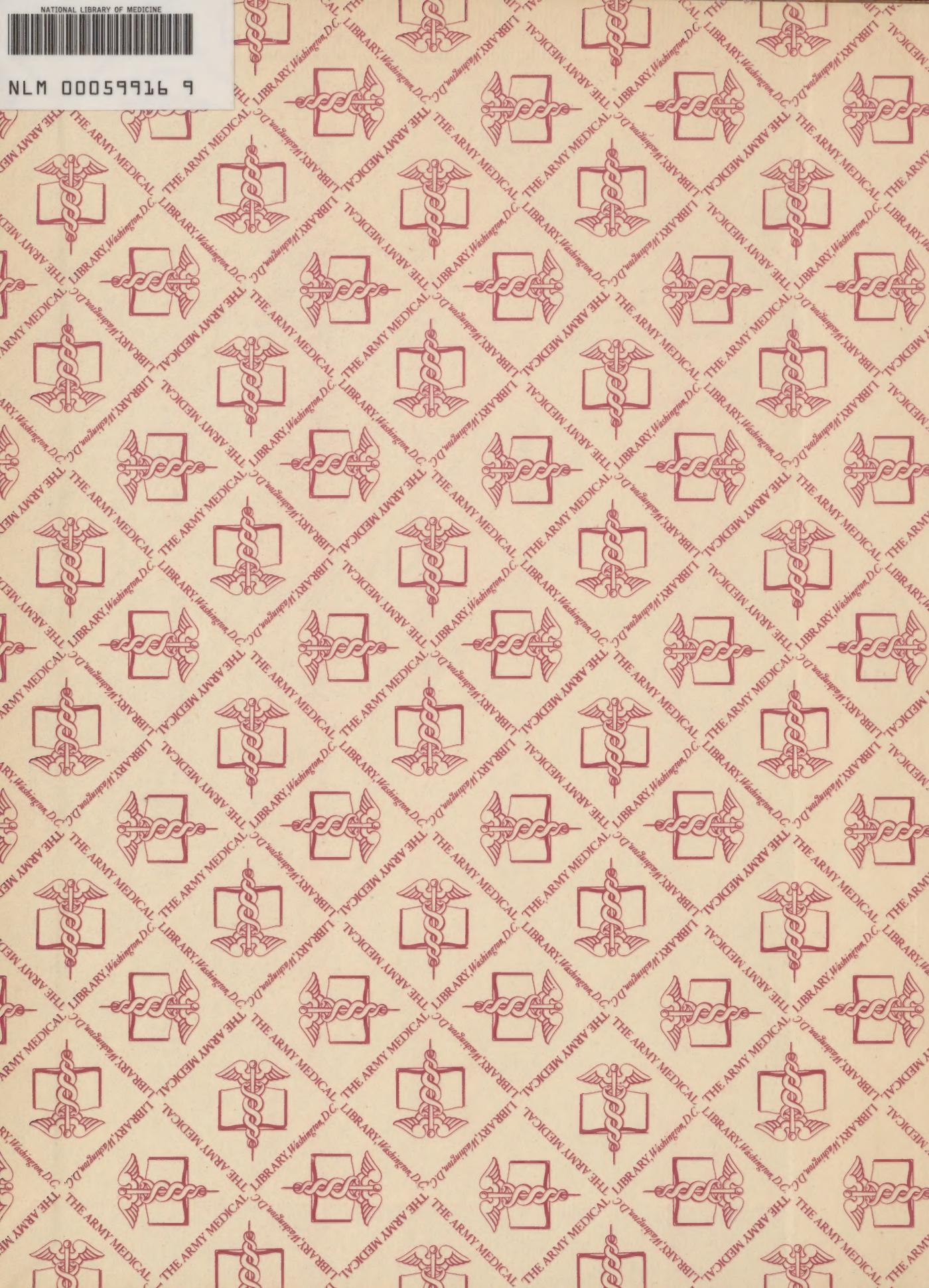
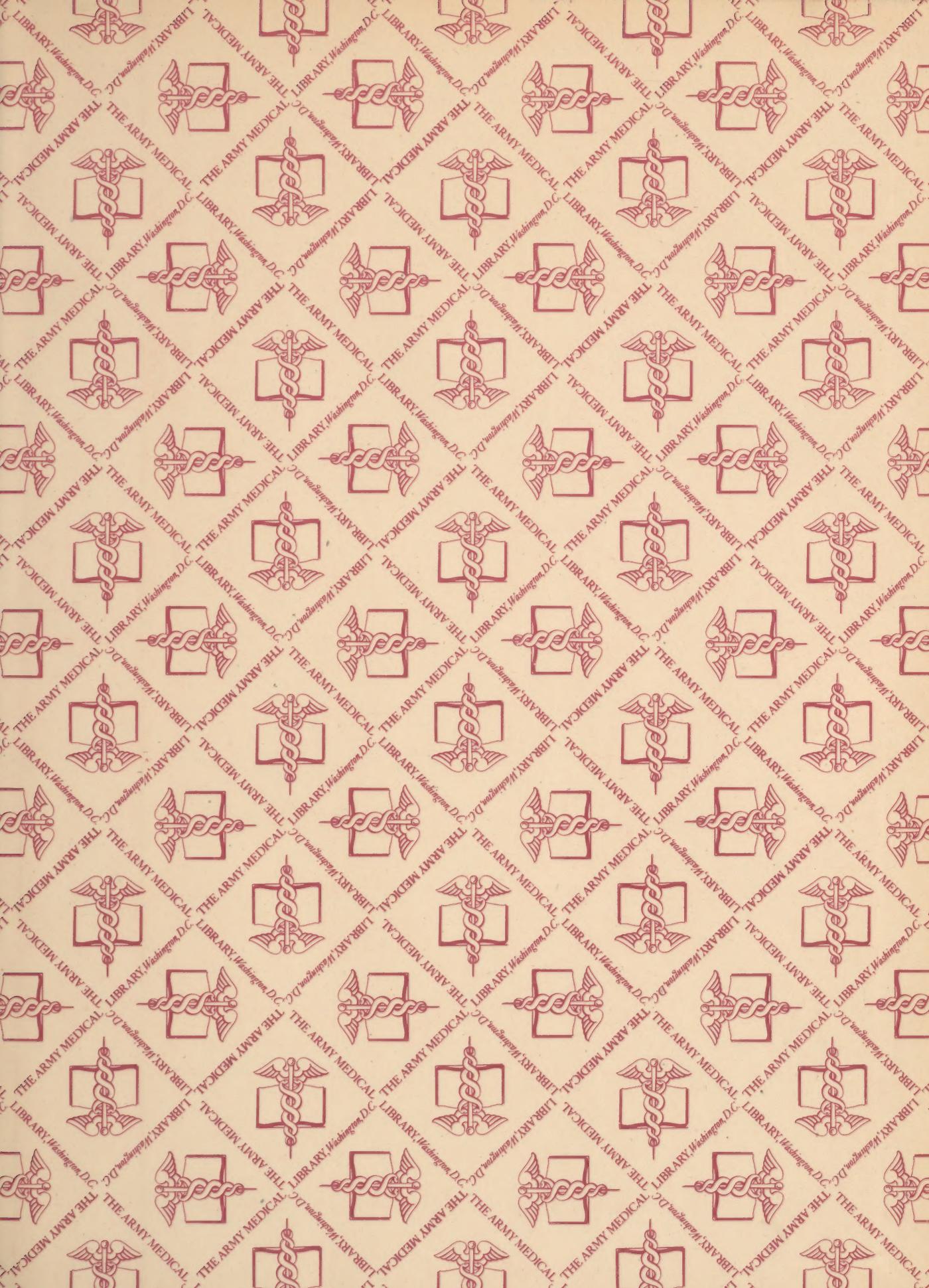






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Army  
U.S. Surgeon General's Office

THE PREVENTION OF DISEASE IN THE UNITED STATES ARMY DURING  
WORLD WAR II

THE PANAMA CANAL DEPARTMENT

E V. 113

VOLUME I - General Health Measures

VOLUME II - The Protection of Troops Against Specific Diseases

VOLUME III - Civilian Health Problems

This history is being made available in manuscript form pending the completion of the official History of the Medical Department in World War II, and must be considered as a draft subject to final editing and revision. Persons finding errors in facts or important omissions should communicate with the Historical Division, Army Medical Library, Washington 25, D.C.

It is emphasized that all statistical data in this monograph are tentative and subject to revision when tabulation of individual sick and wounded report cards has been completed.

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Istotan bensivatuk „battibas“ neki bensivatuk eli bensivob elid?  
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THE PREVENTION OF DISEASE IN THE UNITED STATES ARMY DURING  
WORLD WAR II  
THE PANAMA CANAL DEPARTMENT

1 JANUARY 1940 TO 1 OCTOBER 1945  
VOLUME I  
GENERAL HEALTH MEASURES

EDITOR IN CHIEF

WESLEY C. COX  
COLONEL, MEDICAL CORPS  
DEPARTMENT SURGEON



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## GENERAL HEALTH MEASURES

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## Chapter 1

### INTRODUCTION

The health of the troops, The Panama Canal Department during the World War II period, 1 January 1940 to 1 October 1945, was excellent. Table I sets forth the admission rates per thousand per annum for all causes and for the most important diseases affecting the health of troops.

TABLE I

Rates per Thousand per Annum Admissions All Causes and Admissions Common Respiratory Diseases, Venereal Disease, Malaria, Injuries and Common Diarrheas, Panama Canal Department, for the Calendar Years 1940, 1941, 1942, 1943, 1944, and 1945, from 1 January to 1 October.

Rate per Thousand per Annum

Cause of Admission	1940	1941	1942	1943	1944	1945
All Causes	835.0	881.4	1009.5	794.1	633.9	656.6
Common Resp. Diseases	187.1	159.6	117.7	77.5	81.5	137.4
Venereal Disease	66.1	64.8	60.8	42.7	20.3	15.1
Malaria (Primary and Recurrent)	56.8	51.8	111.7	42.6	14.5	8.9
Injuries	116.4	107.6	117.8	109.3	73.7	58.7
Common Diarrhea	1.6	2.9	4.4	3.5	2.0	4.1

An energetic and continuous campaign of training and indoctrination in preventive medicine, sanitation and hygiene was constantly carried on during the World War II period. All individuals were instructed and indoctrinated in public health and the methods of prevention of disease. All available prophylactic measures were used and working quarantines were instituted whenever infections or contagious diseases occurred in a unit or organization. Debarking troops were physically inspected and all suspicious or suspected cases of infections or contagious disease were screened out and placed under observation.

It is believed that the annual rates per thousand per annum for epidemic cerebro-spinal meningitis and for measles, both rubeola and rubella for the World War II period, 1 January 1940 to 1 October 1945 as set forth in Table II, are indicative of the excellent results obtained by the preventive medicine program in the Panama Canal Department.

TABLE II

Rates per Thousand per Annum, Epidemic Cerebro-Spinal Meningitis, Rubeola and Rubella, Panama Canal Department, for the Calendar Years 1940, 1941, 1942, 1943, 1944, and 1945, from 1 January to 1 October.

<u>Disease</u>	<u>Rate per Thousand per Annum</u>					
	1940	1941	1942	1943	1944	1945
Epidemic C-S Meningitis	0.0	0.03	0.02	0.06	0.1	0.03
Rubeola	0.7	2.5	1.4	0.6	1.1	0.3
Rubella	0.7	1.4	0.3	1.2	5.5	0.8

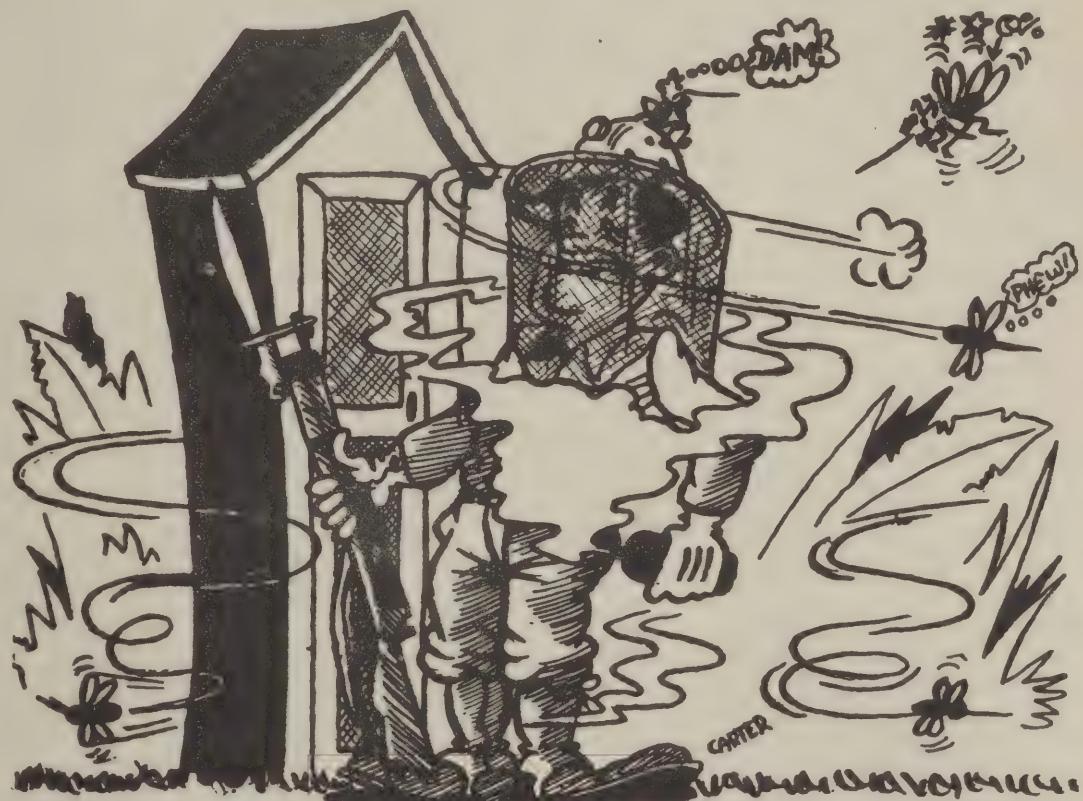
Special programs for the control of venereal disease, malaria, water borne diseases, diseases caused by the intestinal group of bacteria, respiratory diseases, the prevention of injuries, disposal of human and animal wastes, and for the control of rats, flies and other vermin were diligently carried out.

The programs of preventive medicine used in the Panama Canal Department are discussed in the chapters which follow.

The datum set forth in these chapters is based upon the personal experience of the editor and author who was Department Medical Inspector from 8 August 1939 to 9 May 1943 and Department Surgeon from 10 May 1943 to 20 March 1946 and official records.

In order that all military personnel should be thoroughly indoctrinated in all pertinent sanitary regulations each major unit of the Panama Canal Department published a complete compendium of sanitary regulations for distribution throughout the unit. A copy of the Sanitary Regulations was published in Spanish by the Coast Artillery Command for use of Insular troops of that unit.

# REGLAMENTOS SANITARIOS



A GOOD STUDENT

CUARTEL GENERAL, COMANDO  
DE ARTILLERIA DE COSTA

OFICINA DEL CIRUJANO, SEPT., 1944



Report, Subject: Reglas Sanitarias OMITTED FROM THIS REPRODUCTION

EXHIBIT A







HE ONLY LOOKED AT THE COVER OF THIS BOOK  
-- NOW HE'S WELL COVERED.

## Chapter 2

### CLOTHING

The Panama Canal Department was territorily contained within the boundaries of the Canal Zone and the Republic of Panama prior to 1941. With the acquisition of bases in Central and South American Republics the Department underwent a vast territorial expansion until it stretched from approximately 20 degrees north latitude to 5 degrees south latitude and from 77 to 89 degrees west longitude.

Prior to 1941, only one type of clothing was required, i.e. tropical. With the expansion of the Department and the location of positions and bases in the mountainous portions of Central and South America and on Seymour Island in the Galapagos Archipelago clothing suitable for temperate as well as tropical climates was required.

Fairly adequate supplies of clothing existed in this Department throughout the World War II period.

The uniform authorized for the Panama Canal Department from 1 January 1940, except while attending drill, other military instruction, and while on fatigue consisted of khaki shirt, with long sleeves, and either new or old type collar, khaki trousers, tropical helmet and leather shoes. Fatigue uniform was worn as outlined above.

The issue underwear consisted of cotton shorts and cotton, sleeveless undershirts. Cotton socks were issued.

Footwear prior to 7 December 1941 was either the garrison or field shoes.

The khaki shirt, 8.2 ounce cotton was excellent. The long sleeves afforded adequate protection. The neck could be worn open. The long trousers were comfortable, pockets were adequate for garrison wear.

The underwear was satisfactory. The cotton socks were too light for field use. Later, when the cushion sole sock became available, marching in and general use of the field shoe was made very much more comfortable.

The fatigue clothing issued prior to 1 January 1941 was of all types and descriptions. Color varied from blue to gray,

material from denim to twill. The two-piece fatigue uniform was preferred by troops because coat or jumper could be easily removed while on fatigue details. The fitted short jumper was supplied in small quantities. This was the best-looking fatigue uniform, and was well liked. Coveralls were especially liked by mechanics, both air and ground, and by chauffeurs. Men objected to marching in these. The closed seat made it necessary to disrobe in order to go to the stool.

In general, the material of which fatigue uniforms were made was too heavy for the tropical lowlands. This weight cloth served excellently in the tropical highlands. This material dries slowly and wearers are subject to chilling after the cloth has become wet.

A test of open neck, short-sleeved shirts and short trousers was conducted by the Air Corps with view to general adoption for use in this Department. This uniform while suitable for post wear was totally unsuited for use in the jungle or in areas where biting arthropods were plentiful.

Jungle uniforms were tested. The early types were twill coveralls painted with camouflage paint. They were satisfactory from the point of view of concealment, the cloth did not dry rapidly. It was not proof against mosquito bites.

The nylon jungle uniforms were excellent. They were light, dried quickly, were snag proof and were not readily penetrated by mosquitoes.

Headgear.--The tropical helmet authorized until 1942 was the best hat for this area. It was light, permitted free circulation of air, protected the face and neck against both rain and sun, and was the only headgear suitable for use with the mosquito headnet.

The fiber lining of the steel combat helmet while designed as a shock absorber served a useful purpose in this area but was not equal to the tropical helmet. It did not permit free circulation of air and was not suitable for use with a mosquito headnet.

The garrison cap, formerly the service cap, was well liked by the personnel. It was light in weight, readily folded and placed beneath the belt or in a pocket when indoors, easily laundered and snappy in appearance. However, it offered no protection against the sun or rain.

The service cap, formerly the garrison cap, is too heavy and binds the head too tightly for use here. The peak does shield the eyes, but the cap offers no protection against rain.

Footwear.--The garrison shoe was an item of issue prior to January 1942. This was one of the comfortable shoes for this climate.

The field shoe with skin-side out, while heavy, proved an excellent shoe. The stitching in the leather soles did not stand up well when constantly wet. The rubber sole was a great improvement and had fine anti-skid properties.

The canvas jungle-boot was well adapted for use in the jungle but did not give full foot support.

No raincoat developed was satisfactory. All issue raincoats were treated to make the cloth water resistant and as a result, cut down greatly on air porosity. Men marching in raincoats soon became wet on the inside, and the wearer was thoroughly uncomfortable.

The canvas legging.--This item of equipment was an excellent adjunct for field use. It was comfortable, protected the shoe top, was light and yet heavy enough to offer protection against snake bites.

The white clothing issued for cooks was too heavy for use in kitchens here. As a result, cooks, assistant cooks, and K.P.'s worked in their sleeveless undershirts. A limited quantity of quarter-sleeve "T-shirts" were obtained from the Navy. These protected the armpits, prevented perspiration from dripping on to the foods, and gave the wearer a neater appearance.

Likewise, the white hospital coat is too hot for hospital wear. The Navy used the quarter-sleeve cotton "T-shirt" in this area. This would be a great improvement for use in Army hospitals.

Wool clothing was issued for use in the highlands of Guatemala and Costa Rica. Jackets were issued for use at night in Salinas, Ecuador, Tatara, Peru, and Seymour Island, and Galapagos Islands.

Issues of clothing for lowlands of the Panama Canal Department from 1 January 1942 to 1 October 1945 were as follows:

Khaki shirts, 8.2oz	each 4
Khaki trousers, 8.2oz	each 4
Cotton undershirts	each 6
Cotton underdrawers	each 6
Socks, pair	each 6
Rain coat	each 1
Shoes, field, pair	each 2
Garrison caps	each 2
Fatigue uniforms	each 2

Laundry facilities were limited between 1 January 1941 and 31 December 1944 when the new Quartermaster Laundries were placed in operation. During this period, post-exchange laundries were used and many units developed unit laundries.

Frequent change of underclothing and socks is absolutely essential in this area. Boiling of body clothing is necessary in order to destroy the spores of fungi. Many cases of epidermatophytosis were traceable to the wearing of soiled, perspiration-impregnated clothing, especially fatigue uniforms. This was corrected by the individual laundering his own clothing whenever necessary.

## Chapter 3

### HOUSING

The barracks available for the housing of the troops of the Panama Canal Department on 1 January 1940 represented a cross section of the various construction policies of the Army in this area from 1915 to 1940. The troops at Fort Sherman, Fort Randolph, The Post of Quarry Heights, and the Post of Corozal were housed in two-story wooden barracks with normal capacity of 25 to 100 men. At Fort Davis there were three concrete battalion barracks constructed during 1917, concrete company and detachment barracks and also wooden barracks. The barracks at Fort De Lesseps were contained within the post-administration building which also housed the post-exchange, the post-dispensary, and post-utilities offices as well as the necessary supply rooms. There were four battalion barracks at Fort Clayton, constructed during 1917, a concrete battalion barracks constructed in 1933, and four concrete company or detachment barracks. All barracks at the Fort Amador were battery barracks of concrete construction built during 1916. The barracks at Albrook Field were the most modern. They were of concrete construction with mess hall, day room and unit offices on the first floor, and two squad rooms each on the second and third floors. France Field also had barracks of concrete construction, three stories high, with mess hall, day room, and unit offices on the first floor, and squad rooms on the other two floors. There was a single wooden barracks at Bruja Point and also a single wooden barracks at the gunnery camp at Rio Hato, Republic of Panama.

All barracks were of open construction and had porches. All barracks were screened with copper screening.

A construction program had been approved, but work did not start until the fall of 1940. This program included the construction of a new post on the Atlantic side designated as Fort Gulick, a new Ground Force post designated as Fort Kobbe area a new air base designated as Howard Field. Additional barracks were to be constructed for the housing of ground troops at Fort Clayton, Albrook Field, the Post of Quarry Heights, Albrook Field, Fort Davis, and Fort Sherman.

The influx of troops during 1940 and 1941 resulted in the congestion of the barracks available at the permanent stations of this Department. Floor space was reduced to fifty feet and when this rapidly proved insufficient, double decking was practiced. All available porch space was used. During 1940, barracks and other buildings required to house an infantry regiment were constructed by troop labor at Paraíso, Canal Zone, the former site of headquarters of the French Canal Company in the late eighties and later a Canal Zone town and headquarters of the dredging division. Temporary barracks were also constructed at Albrook Field, France Field, Fort Randolph and Fort Amador. The Rio Hato Rest Camp which was to be a recreation area was converted to a training center. Despite the efforts made to provide adequate housing, the use of tentage became necessary during 1941. As rapidly as possible wooden barracks and hutments were constructed at Coast Artillery batteries, automatic-weapon and searchlight positions, at aircraft warning stations, at Infantry outpost positions. Wooden barracks and revetment alert hutments were also constructed at the new airbases and satellite air fields which were being developed.

December 7th 1941 found construction advancing, but also saw barracks crowded to the limits of their capacity and troops living under canvas at permanent posts as well as at outposts.

The arrival of reinforcements during the first six months of 1942 further complicated the situation. The newly arrived combat teams were housed under tentage while T/O type barracks were constructed at Camps Chorrera and Pacora.

Tentage continued in use until 1943, when the completion of the new barracks started in 1940 and 1941 provided space for all troops.

Every effort was made to mosquito-proof the pyramidal and wall tents used by troops, tent floors and tent frames were constructed. The tent frames were screened to tent shoulder and were provided with screen doors. "T" frames were constructed and the use of mosquito nets was obligatory. Concentrated pyrethrum extract, 1 part, 20 times concentrated in 15 parts of kerosene was used nightly as an insecticide.

At Coast Artillery positions, the troops lived in tents and in the corregated iron buildings provided at the older positions for housing the power units, the lights and the sound equipment during the quiet days of peace, while awaiting completion of barracks and hutments. In order to provide dispersal of the barracks and to

place them at a distance from the guns, a double set of buildings was provided. Barracks were provided as permanent quarters. Huts close to the guns were provided for those troops on alert status so that no time would be lost manning the guns when an alarm was received.

Fifty square feet of floor space per man was provided in the T/O type barracks, but only 25 square feet of floor space in the hutments.

At the air bases and satellite air fields, hutments were built close to the revetments so that alert crews might be as close as possible to their ships.

The majority of barracks of T/O type construction were built eight feet off the ground on concrete columns. Later a concrete slab was poured, and the ground area was enclosed by the use of concrete tile and screening. Adequate storage space, recreation room space, office space, and shop space was provided in this manner.

All T/O type barracks were of mosquito-proof construction, and all doors opened outward. Latrines and shower rooms were also of mosquito proof construction.

The rate per thousand per annum for both primary and recurrent malaria increased greatly during the construction period from 1940 to 1942, inclusive, reaching the peak in July 1942. During this period large numbers of troops were living under primitive environmental conditions without proper housing, the benefit of repellents, or suitable repressive drugs.

At tent camps, the first buildings constructed were the kitchens and mess halls. These were frame T/O construction, on concrete slabs and were screened and mosquito-proof. Water carry sewage and screened mosquito-proof latrines and shower rooms were constructed. As soon as possible, frame T/O type mosquito-proof barracks were constructed on concrete slabs.

The approved tropical 100 man, 150 man and 200 man barracks constructed in accordance with the 1940-1941 long range construction program proved ideal. The squad rooms have a normal capacity of 50 men each. By double-bunking and use of porch space, 400 men can be barracked without over-crowding and congestion in a 200 man barracks.

Head to foot sleeping was practiced whenever the space between beds was less than 5 feet. When double-decking was used, double-decking combined with head-to-foot sleeping created a problem.

Adequate showers, lavatories, urinals and toilets were provided for the normal capacity of the barracks and hutments. Any increase in the number of men housed in a barracks necessarily reduced the adequacy of the sanitary facilities. However since the emergency and the war status required a high percentage of troops for guard duty and alert status, the increase in the number of men per sanitary facility actually caused little inconvenience.

A system of hanging clothing and equipage on wires or rods suspended from the ceiling so that these articles were above the living zone added greatly to the comfort of the troops. The first shipment of quonset huts were received in this Department late in 1943. These huts, altered for use in the tropics by placing them so that the long axis of the hut was parallel to the prevailing winds, enclosing the ends with fiber board and screen and providing double doors and a mosquito-tight vestibule, were most satisfactory. They were erected on concrete slabs. The interior temperature was always 10 to 15 degrees cooler than the interior of wooden barracks or hutments at similar locations.

There were no housing difficulties during 1944.

The redeployment period created peculiar problems. The Department Commander decided to permit all possible transiting troops to have at least one night ashore. In addition, it was necessary to dock numerous transports for repairs. Barracks at Albrook Field, Fort Amador, Fort Kobbe, and Fort Clayton were emptied of the troops which had occupied these barracks. The displaced troops "doubled-up" with other units. The squad rooms in the vacated barracks were double-decked, only minimum floor space being provided. Messes were run cafeteria style. In this manner, 500 troops were housed in each 200 man barracks and proportionate numbers in barracks of less capacity.

One of the most difficult tasks resulted from mechanical failure of the hospital ship, REPUBLIC, which, in addition to her regular complement, was transporting 756 casual officers of the Army Nurse Corps to the South Pacific. These nurses were quartered at Albrook Field for approximately 3 weeks, four 200 man barracks being used.

## Chapter 4

### NUTRITION

The troops in the Panama Canal Department were exceptionally well nourished during the World War II period, 1 January 1940 to 1 October 1945.

Prior to the attack on Pearl Harbor, the troops were subsisted on the garrison ration. Excellent transportation facilities provided ample stocks. Dry stores were maintained at the Quartermaster warehouses at Fort Davis and the Post of Corozal. Perishable items were stored in the Mount Hope cold-storage plant of The Panama Canal until the construction of the quartermaster cold-storage plant in 1943.

The Quartermaster was able to purchase ration-component items from the Panama Canal whenever necessary, and to replace them in kind when shipments were received from the United States.

Unit and organization messes were authorized to purchase from the Panama Canal Commissaries. In this manner, milk, fresh vegetables, and exceptional articles were obtained with that portion for such ration allowance provided for such non-Quartermaster purchases.

The menus of the various messes were checked regularly by the Department Medical Inspection officer in order to insure adequate caloric value, proper balance with relation to fats, protein and carbohydrates, and not less than the minimum vitamin content. In addition, menus were checked to avoid sameness. The average caloric value of the ration per day during the pre-World War II period was 3800 calories.

The troops of the Panama Canal Department were placed on the field ration 1 January 1942. With this transition, changes in the method of issue took place, and the amount of cash for purchase of exceptional and additional articles on the open market was reduced to 10 percent of the ration value.

The hospitals were exempt from using the field ration and continued to use the garrison ration. All enlisted detachments at the hospitals of this Department were placed on the garrison ration.

In spite of active submarine warfare which developed in the Caribbean early in 1942 the receipt of both dry and perishable subsistences stores was adequate.

The development of the Master Menu greatly simplified the issue of subsistence supplies. Organization ration break-down points were established. Strength returns were submitted daily by the units of each organization. These were compiled and the total strength of the organization furnished to the Quartermaster Depot servicing the organization. The quartermaster issued supplies in bulk for the entire organization. Deliveries were made to the organization ration break-down point, where the necessary break-downs were accomplished and the rations issued to the subsidiary units of the parent organization.

Field ration inspections were made regularly of stocks on hand at unit messes and instituted exchanges of surpluses between various units and organizations. Thus a unit having a surplus of canned tomatoes might make an exchange with a unit having surplus flour.

The Department Ration Inspector visited all messes and instructed mess sergeants and cooks in the proper methods of conserving food, preserving the vitamin and salt content, organizing the time of cooking so that the various foods were ready to serve at the mess hour and not from one to two hours before the hour for serving, and cooking in various manners so that all tastes might be pleased.

A mess council consisting of the Chief of Subsistence Section, Quartermaster Depot, the Department Subsistence Inspector, the Commandant of Cooks and Bakers School, and the Department Medical Inspector reviewed the monthly Master Menus two months in advance. The caloric values, fat, protein, and carbohydrate balance, vitamin and salt content, and the component items of the Master Menu were carefully checked. The chief subsistence branch gives all available information relative to the availability of the component items. The Ration Inspector and the Commandant of the Cooks and Bakers School checked the types of preparation which were listed. The Medical Inspector calculated the total daily caloric values, the fat-protein-carbohydrate ratio and the vitamin-salt content. Substitutions, changes in methods of preparation and increases or decreases in amounts of various component items were made as required.

The caloric value of the daily ration varied between 3500 calories and 4400 calories during the period 1 January 1942 to 1 October 1945.

The field ration inspectors and the Department Subsistence Inspector reported on the suitability and plentifullness of the ration as received and cooked in the field based on the reports, changes in the Master Menu, either increases or decreases, were made. For example,

it was found that troops stationed at Seymour Island, Galapagos Island, where the climate was semi-tropical, although virtually on the Equator, and characterized by a marked drop in temperature after sunset, required a diet of higher caloric value than troops in the lowlands of Panama. Likewise, troops constantly doing heavy manual labor required a ration of increased caloric value. Troops doing sedentary work at a headquarters ate less and therefore were amply nourished by natural choice on a ration of lower-than-standard caloric value. Changes were made to conserve this food.

The Insular Troops in this Department desired a full Puerto Rican menu. The Department Commander ruled that a modified Continental ration was required in order to properly nourish these troops and permit them to perform the physical exertions required in the performance of duty. The main modifications consisted in the substitution of additional rice for part of the potato component, a small increase in sugar in place of part of the flour component, and additional issue of beans and modifications of the meat component.

Air Corps personnel on long reconnaissance flights were not only provided additional items in their ration, but were also issued multiple vitamin capsules.

Every effort was made to provide adequate supplies of the mineral salts, especially the calcium salts. Powdered milk was used in sauces, in soups, as a flavored beverage, and in puddings and ice cream. Where milk was not available, additional issues of ice cream were provided. The ice cream was brought in by aircraft when necessary.

The development of local sources of food assisted the maintenance of a properly balanced ration. Late in 1940 the Department Medical Inspector and Department Veterinarian assisted in the development of a supply of pasteurized milk from tuberculin-tested and abortion-free cattle. This was deemed necessary because the Third Lock Project caused the increase of Panama Canal employees and a reduction in the amount of milk furnished the Army by the Mindi Dairy. In 1943, the Quartermaster was able to purchase 800 gallons of milk daily from the dairy in the Interior of Panama.

The office of the Coordinator of Inter-American Affairs assisted the Quartermaster greatly by developing the growth of vegetables in the fertile volcanic areas of Costa Rica, Guatemala and Ecuador. Fruits, especially citrus fruits, were made available in these countries and in Colombia.

A source of beef was developed in Guatemala. The very fine rastro (abattoir) at Escuintla was modified and a chill and freeze room

built. The Department assigned a qualified veterinary officer and a meat and dairy hygienist to this rastro. The first beef was shipped in November 1943. The carcass beef in quarters arrived in good condition. It was graded as high-commercial and materially aided in providing an adequate supply of beef for the troops of this Department; approximately 250,000 pounds of carcass beef was shipped each month.

There were no local sources of fresh fish. Excellent canned tuna was obtained from a canning plant in Costa Rica. This was subsidiary of a nationally known food-packing company in the United States. The product was canned in oil of sesame.

A source of paste products was developed in Costa Rica. The flours used were imported from Canada. The plant met sanitary requirements. All employees were A.B.W. tested.

Refrigeration was provided for all messes. With the exception of Camps Chorrera and Pacora, mechanical refrigeration units were installed in all kitchens. These varied from 15 cubic foot kerosene type mechanical refrigerator boxes to large walk-in refrigerators provided with chill and freeze compartments.

The cold-storage plant at the Post of Corozal was completed in 1943. Adequate chill and freeze space was provided for the needs of the Department. Ice was also manufactured at this plant.

Late in 1942 the Post Exchanges, Panama Canal Department, started to make ice cream using electrically operated mixers and soft freezers. Batteries of hard freezers were also installed. Within a year, all exchanges, even those at the outlying bases, were equipped for the manufacture of ice cream. Messes then started purchasing ice cream from the exchanges.

## Chapter 5

### PERSONAL HYGIENE

The personal hygiene of the individual soldier of the Panama Canal Department was continuously maintained at a high standard during the World War II period 1940 to 1 October 1945. The provisions of AR 40-205 relative to personal cleanliness and care and hygiene of feet were meticulously carried out in all organizations and units.

Sanitary facilities.--In spite of the necessary reduction of floor space per man in barracks and the use of double bunking, and the sanitary installations, i.e. shower baths, latrines, urinals and lavatories, the following were the minimums maintained from 1 January 1940 to 31 December 1943:

Shower heads	5% of strength of unit
Latrine seats	8 1/3% of strength of unit
Lavatories	10% of strength of unit
Urinals	5% of strength of unit

Hot running water was provided in all barracks at permanent posts, camps and in bases. Adequate supplies of fresh water were maintained at all outlying installations and positions with the exception of Salinas, Ecuador and Seymour Island, Galapagos Islands where salt water showers were installed. Two sets of duck-boards were provided for each shower. These sets were used on alternate days. The idle set was sunned while not in use. This aided in the reduction of the fungus infection of feet.

The shower foot-baths were unsatisfactory. Fungus infections of the feet and body were reduced by daily bathing, the brisk drying of the body with a clean towel, especially the interdigital spaces, the arm pits and the groin and the daily use of foot powder.

Portable shower baths were constructed and used in connection with the Engineer Water Purification Unit at temporary camps and bivouacs. Duck-boards were an integral part of this set-up.

Bedding.--Cots, mattresses and pillows were provided for all personnel at permanent posts, camps, stations and air bases. Sheets, pillow cases and mattress covers were issued for use at these installations. The use of mattress covers and bed linen, maintained the pillows and mattresses in good condition. The incidence of fungus and other skin infections was reduced.

Airing of Bedding.--Mattresses, blankets, pillows, and bed linen were sunned whenever weather permitted.

Clothing.--Clothing was required to be kept clean. Socks were changed daily.

Care of the feet.--All personnel were thoroughly instructed and completely indoctrinated in the methods for proper care of the feet and the toe nails.

Care of the teeth.--Dental surveys were regularly carried out. In spite of rapidly changing personnel and the arrival in this Department of large numbers of inductees, especially Insular inductees who were dental cripples every effort was made to place as high a percentage of the personnel as possible in Class IV. In order to provide proper dentures and other dental prosthetic appliances the Department Dental Laboratory frequently worked night shifts.

Instruction in the necessity of dental cleanliness and the proper individual care of the teeth were given to all personnel.

Sex hygiene.--Instructions in sex hygiene were given to all military personnel by the unit or organization Medical officers. Groups not larger than a squad were instructed. Every effort was made to conduct this instruction on a high moral plane. Individual instruction was given wherever the Medical officer or Chaplain considered this more advantageous.

Shoe fitting.--All shoes were fitted in accordance with the provisions of the training manual. All individuals with flat feet of any degree were referred to the Orthopedic Clinic for examination and advice relative to exercise of feet or the necessity of orthopedic appliances.

## Chapter 6

### WATER

#### a. General.<sup>1</sup>

The beginning of World War II period, 1 January 1940 to 1 October 1945, found the Panama Canal Department in the midst of a tremendous expansion to adequately deploy and provide accommodations for the troops assigned to the defense of the Canal. With this rapid preparation for any emergency came the necessity to provide for one of the most important needs of the troops, that of adequate water supplies.

In one respect, the Department was fortunately situated. There existed two major and one minor complete water purification plants owned and operated for many years previous to the emergency by the Panama Canal. For the Air Bases in Guatemala City, Guatemala, and San Jose, Costa Rica, there existed water purification plants owned and operated by these municipalities. The International Petroleum Co. owned and operated a modern filtration plant at Talara, Peru, which was utilized for the Air Base, located there. With the exception of the above mentioned plants, there were no other systems of any importance available. Consequently, it was necessary to provide numerous independent supplies, and this was done utilizing practically every known source of supply. Included in these were wells, springs, lakes, rivers, streams, roof collection systems and salt water distillation plants.

#### b. The Miraflores System.

The Miraflores Water Purification Plant owned by the Panama Canal is located on the East bank of the Canal about one mile south of Fort Clayton, C.Z. Raw water is taken normally from Chagres River at Gamboa, C.A. It may also be taken from the Canal just south of Paraiso, or in an emergency from Miraflores Lake near Red Tank, C.Z. The maximum capacity of the plant is 24 million gallons per 24 hours. Treatment of the water consists of aeration, pre-ammoniazation, pre-chlorination, addition of aluminum sulphate and activated carbon mixing, flocculation, sedimentation, filtration, post-ammoniazation and post chlorination. The water and continuity of service furnished by this plant was ideal in every respect, except that the 0.4 ppm chlorine residual required by Army regulations could not be maintained at Army installations remote from the plant. This fact was a cause of considerable concern to Army officials and much time and study were spent in attempting to find a practicable method of correcting this difficulty. The distribution and storage systems for the Miraflores Plant is very complex and major consumer areas are widely scattered

from points less than one mile from the point of application of the chlorine to points ten or more miles away. It was found that the only methods of improving chlorine residuals at Army installations would be to install chlorinating equipment at each Army installation or to provide for "break-point" chlorination at the purification plant. Either of these solutions would have required very extensive new equipment and additional use of chlorine. It was therefore considered more practicable to use methods to be described hereinafter to insure the safety of the water for human consumption rather than by the requirement of a fixed chlorine residual of 0.4 ppm. Army installations furnished water by the Miraflore Plant were as follows:

1. Post of Quarry Heights
2. Ft. Amador
3. Ft. Kobbe--Howard Field
4. Albrook Field\*
5. Corozal
6. Ft. Clayton
7. Camp Paraiso
8. Panama Air Depot
9. Numerous Tactical Positions

c. The Mt. Hope System.

The Mt. Hope plant is owned and operated by the Panama Canal. It is located about two miles northwest of Ft. Gulick. The raw water intake is located in Gatun Lake near Ft. Gulick. The maximum capacity of the plant is 12.2 million gallons per 24 hours. Treatment is complete and consists of aeration, pre-ammoniazation, pre-chlorination, addition of aluminum and activated carbon, mixing, flocculation, sedimentation, filtration, post-ammoniazation and post-chlorination. Like the Miraflores Plant the water furnished by this plant was excellent in every respect except the lack of 0.4 ppm chlorine residual at Army Installations. This problem was handled in the same manner as in the case of the Miraflores Plant discussed in the preceding paragraph. Army Installations furnished water by the Mt. Hope Plant were as follows:

1. France Field	5. Ft. Gulick
2. Ft. Randolph	6. Ft. Davis
3. Ft. Sherman	7. Numerous Tactical Positions
4. Ft. De Lesseps	

d. The Madden Dam Plant.

The Madden Dam Plant is located at Madden Dam with its intake in Madden Lake upstream from the dam. The maximum capacity of the plant is 150,000 gallons per 24 hours. Treatment consists of aeration, addition of aluminum, mixing, coagulation, sedimentation, filtration, post ammoniazation and post-chlorination. No problems arose in water obtained from this plant except the lack of 0.4 ppm chlorine residual which problem was handled the same way as the similar one arising for water from the Miraflores and Mt. Hope Plants. One tactical position obtained water from this plant.

e. The Guatemala City, Guatemala Plant.

This plant is owned and operated by the City of Guatemala. The quality of the water furnished the Army by this plant was generally satisfactory. Due to the fact that the Army could not control its operation, it was thought necessary to resort to continuous chlorination as a matter of safety. This was done with the result that the Air Base was furnished an ample amount of potable water with 1.0 ppm chlorine residual.

f. The San Jose, Costa Rica, Plant.

This plant which includes a slow sand filtration unit was in operation before the beginning of World War II. Since the Army could not readily supervise its operation, the water used for drinking and cooking at the Air Base at San Jose was treated with chlorine, a 1.0 ppm residual being maintained. With this minor adjustment in operation the water furnished the base was generally satisfactory.

g. The International Petroleum Co. Plant at Talara, Peru.

This plant is a fairly modern installation. The quality of the water furnished was satisfactory although the chlorine residual in the water delivered to the Air Base was only 0.1 ppm. Due to the fact this plant was operated under the supervision of well trained operators, chemists and bacteriologists, it was considered more practical not to re-chlorinate the water at the base. Frequent bacteriological analyses were always negative for coli-aerogenes organisms.

h. Purification Plants Constructed and Operated by the Army.

An unique purification plant was constructed by the Army at Camp Pacora, P de P. The source of water was the Pacora River, a

mountainous stream originating in sparsely inhabited regions. The plant consisted of a preliminary sedimentation basin, a coarse filter and secondary sedimentation basin, rapid sand filters and mechanical chlorination units. Although no coagulant was added during the purification process, the effluent from the plant was of remarkable clarity and even before chlorination bacteriological analyses were negative.

Perhaps the most difficult to supply of all installations in the Department was the Air Base of Galapagos Archipelago, Ecuador. No streams or lakes existed on the Island nor was there any ground water supply. It was therefore necessary to convey water in steel barges from an island about 50 miles away where there was a spring. A small impounding dam was built downstream for the spring and water was conveyed from the reservoir so formed, by gravity through a pipe to a pre-sedimentation reservoir near the loading docks for the barges. The water was drawn by gravity from this sedimentation tank into the barges. When the barges had been towed to the Air Base, the water was pumped from the barges through rapid sand filters into a clear well where chlorine was added. This water system was far from ideal, its deficiencies being insufficient quantity at source, excessive transportation, inadequate filtration and inadequate chlorination facilities. It is anticipated that a new supply from another island closer to the base will be developed if this base is retained by the United States Government.

Wells. For small, isolated stations, wells proved to be generally the most satisfactory supply of water. A complete sanitary survey of the proposed water-shed was made by the Department Medical Inspector in company with a member of the staff of the Constructing Quartermaster. The terrain and the local geological formations were studied. The installation lay-out plans were studied. The most favorable site for a well was then selected. Producing wells were brought in in approximately 70 percent of the primary sites selected. Water was ordinarily found at from 50 to 200 feet. Since danger of surface contamination existed, it was the policy to drill to between 150 and 300 feet in search of the deep water strata. When such a strata was found, the inflow of water at the higher level was sealed off, and only the water of the deep water bearing strata used. In some instances it was necessary to drill to 500 feet in order to obtain a deep-level producing well. All wells were cased to and sealed in, rock formation whenever a rock stratum was penetrated above the water bearing strata. All wells were provided with a concrete slab at ground level which extended at least 12 inches above the ground. Water-tight pipe-fittings and gaskets were used to produce a water-tight joint where the pipe traversed the concrete slab. The ground about the well-head was

graded away from the well so as to prevent high ground-water from draining toward the well casing. When wells were brought in, the well was pumped for 12 hours. Following this, samples were obtained for bacteriological and chemical analyses. The water from all wells was chlorinated so as to produce a 1.0 ppm chlorine residual at the tap.

Over 150 wells were constructed during the World War II period. While a few of these failed after a short period of use, the use of wells even at large camps and bases was generally classed as highly satisfactory.

The fact that there were no outbreaks of disease of intestinal origin, other than acute outbreaks of food infection in which the water supplies were not involved, during the World War II period, indicates the high bacteriological quality of the water supplies maintained in this Department.

Springs. Springs were not generally available in areas utilized by this Department. Records indicate that only 5 such sources were developed in general proved satisfactory.

Lake Supplies. Approximately 35 field positions in the Department obtained water directly from Gatun Lake. While these supplies were not ideal in every respect, nevertheless this lake proved a reliable source of water and no water borne diseases were traceable to any of these positions. Chlorination alone was the only treatment of the water, a 1.0 ppm residual being maintained at the tap until 1945 when a residual of 2.0 ppm was maintained.

Streams. It was found necessary in some instances to resort to small mountainous streams for sources of supplies. Watersheds of such streams were uninhabited areas in remote sections of the Canal Zone or Republic of Panama. There were approximately 21 such installations in the Department. Some difficulty was experienced in excessive colors, turbidities and iron, but with adequate chlorination alone, a disease free water was produced. A residual chlorine content of 1.0 ppm was maintained at the tap until 1945 when this was increased to 2.0 ppm.

Roof Collection System. Two roof collection systems were used as supplemental supplies. These were not of much value due to the fact that deficiencies of the supplies augmented by the roof collection systems were associated with lack of rainfall.

Sea Water Distillation Systems. Sea water was distilled at two installations in the Department. These were relatively small installations, and the cost of operation of these units was high in proportion to the water produced.

Medical Department Activities in Relation to Water Supplies. The Medical Department, under the direction of the Department Surgeon had three main responsibilities, namely making surveys of proposed new water supplies in company with the Department Engineer representatives, to insure that water finally furnished troops would not be contaminated; making surveys of proposed changes in existing supplies, and collection and analyses of samples for bacteriological interpretations and residual chlorine content. Generally speaking all proposals to the water supplies and changes in existing supplies were presented to the Surgeon's Office for comment and recommendations.

All unit surgeons were required to submit bacteriological samples for their stations at least twice per month. An overall summary of results of these analyses indicates that the bacteriological quality of water furnished troops in this Department was far superior to that required by Public Health Standards. Whenever a sample positive for colo-aerogenes was submitted, an immediate survey was accomplished to determine the cause. In practically every instance, no cause of contamination could be found and subsequent samples were reported to be negative for colo-aerogenes.

Fish bowls containing live minnows and so arranged that top water was constantly circulated through the bowl were maintained at all key points in the Department. These bowls were kept under continuous observation, and it is believed that any toxic substance introduced into the water would have had immediate effect on the minnows and would serve as a warning to prohibit further use of the water.

Residual chlorine tests were taken at all stations every 2 hours from 0600 to 1800. All stations except those obtaining water directly from Panama Canal System Purification Plants were required to maintain a chlorine residual of at least 1.0 ppm at all times. It was found impracticable to maintain the required 0.4 ppm chlorine residual for stations using Panama Canal System Purification Plant water for the reason that rechlorination at stations or "break-point" chlorination at the purification plants would have had to be resorted to. Neither of these alterations could have been practically installed during the emergency and in the light of past performances of these purification plants, it was decided to rely upon bacteriological samples instead of fixed chlorine residuals.

## Chapter 7

### DISPOSAL OF WASTE

#### a. General.

Waste disposal is divided into three main classifications: human excreta, animal excreta, and miscellaneous wastes referred to as garbage and trash, and composed of food scraps, debris, paper, containers of all classes, ashes etc.

Animal wastes were of little importance in the Panama Canal Department during the World War II period. Practically all horses were returned to the United States prior to 1941. The pack mules were returned in 1942.

The disposal of human wastes and garbage and trash were of major importance in this area, for any failure to properly dispose of these wastes leads to the immediate development of grave sanitary hazards and nuisances.

#### b. Disposal of Human Excreta.

##### 1. Disposal by dilution:

A survey of the methods of sewage disposal at permanent posts and stations in the Panama Canal Department conducted in January 1940 disclosed the fact that with the exception of the installations at Bruja Point (now Fort Kobbe) and the gunnery camp at Rio Hato, R. de P., all water borne sewage from posts and stations in the Canal Zone was discharged untreated into adjacent natural waters, either bays or the waters of the Panama Canal. Sewage from the Panama Canal towns was also discharged untreated into the waters of Panama Bay, Limon Bay or the Panama Canal. Likewise, the untreated sewage from the cities of Panama and Colon was discharged into the Bays of Panama and Colon respectively.

Bacteriological surveys conducted to determine the pollution of the waters of the bathing beaches located on the Bay of Panama and Limon Bay showed that the Coli Index of these waters was dangerously high at all beaches except the beach at Naos Island and the Venado Beach at Venado Point. Beaches at a distance of several miles from any sewage outfall had low coli indices. Beaches showing high coli indices were declared "Off Limits" for military use.

Bacteriological examination of the waters from all natural beaches were performed at least once each month.

A study of the methods of sewage disposal in the Canal Zone and the adjacent cities of Panama and Colon was made during 1940. A plan for complete treatment was drawn up. The entry of the United States into the War resulted in holding these places in abeyance until a more suitable time.

There would be no practical advantage obtained from the development of sewage treatment plants at the military installations in the Canal Zone unless like treatment was given the sewage arising in Canal Zone civilian towns, and in the cities of Panama and Colon. The correction of the present situation is a problem for future long range planning.

Sewage treatment plants were installed at the posts of Fort Gulick and Fort Kobbe-Howard Field at the time of construction of these installations during 1941 and 1942. These plants were identical and were designed by the constructing quartermaster. The Medical Department was not permitted to make suggestions, although it was foreseen that the plants would not function properly as designed. Each plant consisted of a grit chamber without either coarse or fine screening, two sedimentation cones, two sludge digestion chambers, an effluent canal into which digested sludge was pumped. No sludge drying beds were provided.

These plants have never functioned properly. They are, in fact, septic tank cones from which the septic sludge is pumped to the digestion chambers. The black septic sludge is later pumped into the effluent canal which outfalls into a small stream flowing to the adjacent bay. The only method by which proper treatment can be obtained at these installations would be to abandon the present plants and build new properly constructed plants.

Chlorinators and chlorine contact basins were installed in 1942 in an effort to reduce the bacterial content of the septic effluent. These have functioned fairly well. Comminutors were installed at the influent canal in 1944, thus obtaining finely divided suspended material.

A septic tank with chlorine contact basin, sludge drying bed, and effluent canal outfalling at Rio Farallon, was constructed at the Rio Hato Rest Camp during 1940. This camp was later used as a training area and then an air base. An Imhoff tank with sludge drying beds was constructed in 1942 to provide for treatment of the sewage of the increased garrison. A chlorine contact basin was provided and the effluent was chlorinated. The outfall was also at the Rio Farallon.

An air base at Guatemala City, Guatemala was developed during 1941 and 1942. Water carry sewage was developed for part of this base. The effluent was disposed of in "dry-wells". These are wells 5 feet in diameter sunk to a depth of 50 feet where a highly pervious gravel stratum was found. This is the standard Guatemalan method of disposal of sewage from small communities. The "dry-wells" were kept tightly covered. The portions of the base not served by this water carry sewage system because of the difficulties of terrain were provided with deep-pit latrines, at least 15 feet in depth.

Camps for field training were developed at Chorrera, R. de P., and Pacora, R. de P., during 1942. Deep-pit latrines were used during the development periods of these camps. Late in 1942, a septic tank with effluent piped to "fill and drain" type contact beds and chlorinated in a chlorine contact chamber after the required holding period in the contact beds, was installed at Camp Chorrera. The effluent from the chlorine contact chamber "out-fell" into a nearby river. Camp Pacora was provided with a septic tank and a chlorine contact chamber with out-fall at the Pacora River.

Pit latrines were used at Seymour Island, Galapagos Islands in 1942 and 1943 during the construction period. Water-carry sewage using sea water to flush the latrines and sewage outfall to the sea was provided in 1944.

Water-carry sewage with septic tanks and chlorine contact beds were provided for the Army Air Base, David, R. de P., Army Air Base, Salinas, Ecuador, Army Air Base, Talara, Peru, and at the Satellite air fields which were developed in the Republic of Panama. All of these "out-fell" into nearby streams or into the sea.

Water-carry sewage, small septic tanks, and chlorine contact basins were installed at all Coast Artillery, Infantry, and Aircraft Warning Stations having a sufficient water supply and suitable terrain.

2. Pit Latrines:

Many small installations were situated in locations where a water-carry sewage disposal system could not be installed. Pit latrines were used at such installations even though they were classified as permanent. All latrine buildings were of fly-proof construction at permanent and semi-permanent installations. Wherever the sub-soil was permeable, pit latrines were routinely treated with a yeast carbohydrate solution.<sup>2</sup> In this climate, yeast acts very efficiently in promoting the digestion of the fecal material. Since fly ova and fly larvae are not digested, the latrine boxes in such pit latrines must be equipped with suitable fly traps.

Pit-latrines properly located in pervious soil where ground water was relatively deep, conditions which existed at many hillside installations served from 12 to 18 months without necessity of relocating the latrine. Provisions were made which prevented surface water from entering the pits. So satisfactory was this method of treatment, that the Division Engineer constructed partially concrete-lined pits with a concrete slab cover at installations where test-bores showed soil conditions and height of ground water to be satisfactory.

3. Straddle Trenches:

Straddle Trenches were used only in overnight camps or bivouacs. Careful inspections were made prior to leaving the area to make certain that all such trenches were properly closed and marked.

4. Miscellaneous Methods of Disposal:

One of the most unusual requirements for sewage disposal in the Department was that of providing facilities for smoke grenade barge personnel anchored in the Canal or lakes near locks. Since there was no appreciable current in the water adjacent to the barges, continuous contribution of raw sewage from the barges would have created serious nuisances.

Accordingly chemical-type toilets were installed on each barge and the contents thereof treated with NaOH, calcium hypochlorite, and Nacionol NR.

## 5. Miscellaneous Waste-Garbage.

### a. Collection:

To eliminate possibility of fly breeding, odors and other possible nuisances, garbage was collected daily from all Army installations. Vehicles used varied from the more elaborate totally enclosed, especially built trucks used by the Health Department, The Panama Canal, to collect Army garbage on a cost plus basis, to lighter simple trucks used by smaller organizations. In some of the larger organizations, separation of garbage into edible, non-edible, trash, glass, etc., was practiced. Separation was found impracticable for individual quarters where all garbage was deposited in single cans by the occupants.

### b. Incineration:

In many of the Army posts and bases, standard rack incinerators were constructed. Tin cans were separated from the garbage, flattened and buried. Other non-combustible materials were also withdrawn after which the remainder of the garbage was placed on racks and burned using wood for required additional fuel.

### c. Land Fill Methods:

In some of the installations in the Department, garbage was disposed of by the land fill method. This process entails the digging of pits or utilizing low ground and so placing the garbage in layers that it may be filled over immediately with earth. Where this operation was properly carried out, this method of garbage disposal proved satisfactory in the Department.

### d. Disposal at Sea:

In the instances that garbage could be placed into the sea far enough from the beach line so that it would not be washed back to the beach, disposal at sea was satisfactory. Some difficulty was experienced in the Department by organizations, in emergencies, and unaware of the nuisances created, dumping garbage directly on beaches which were

fairly close to human habitation. This invariably brought complaints and resulted in the Department prohibiting the dumping of garbage on beaches.

e. Disposal for Hog Feeding:

There was considerable demand for garbage from Army installations by native farmers for use in feeding hogs. During the earlier stages of World War II, to encourage hog raising in an effort to alleviate the acute meat shortage, disposal of garbage for hog feeding was permitted.<sup>3</sup> This practice was discontinued, however, as soon as possible and no garbage was permitted to be collected under contract for use in feeding hogs. This step was taken to prevent the possible introduction of Argentine hoof and mouth disease into the Zone and Republic of Panama through the medium of Argentine meat discarded to garbage.

6. Joint Sewage Disposal Commission.

The Department Commander in 1940 realized the need of a coordinated program for sewage disposal for all the government agencies in the Canal Zone and also in the Republic of Panama. On 14 November 1940, he appointed a Board consisting of representatives from the Panama Canal, the Army and the Navy. The duty of this Board was to make studies and recommendations relative to the establishment of permanent sewage disposal facilities in accordance with recent sanitary improvements. The occurrence of war, however, prohibited the actual construction of facilities. The Board made reports and reviewed projects involving sewage disposal to make sure that any major construction done could be utilized in the overall long range program. On 8 May 1944, the Department Commander appointed a new Board to act as a Permanent Joint Sewage Disposal Commission. This time, representatives of the Republic of Panama were included on the Board.

HEADQUARTERS PANAMA CANAL DEPARTMENT  
Office of the Department Commander

MIMEOGRAPH

LETTER NO. 20  
AG 433-1

APO 834  
19 February 1945

SUBJECT: Yeast Treatment of Pit Latrines.

TO : CGs, Sixth AF, CAC, MF & SC;  
CCs, all posts, camps and air bases.

1. All pit latrines will be treated with yeast in accordance with the following procedure:

a. General. The yeast (*Saccharomyces*) treatment possesses the following advantages:

- (1) Prevents pollution of ground water by overgrowing and destroying pathogenic organisms.
- (2) Attacks carbohydrates and cellulose, thus destroying and digesting organic matters with resultant liquification of the fecal mass which is more readily absorbed into the soil.
- (3) Toilet paper is reduced to a fluid pulp and is digested by bacteria which attack cellulose.
- (4) The usual latrine odors are greatly reduced.

b. Amount of yeast solution required and time of treatment.

- (1) Pit latrines should be yeast treated continuously. Two quarts of potato ferment should be added to each latrine seat twice each week. For example, in the treatment of a four (4) seat pit latrine a total of eight (8) quarts of potato ferment should be added on Monday and Thursday of each week.

c. Use of additional water in arid climates. Pit latrines at camps and in arid climates must be treated daily by adding two (2) quarts of water to each seat. This will provide sufficient moisture for continued action of the yeast. (DO NOT USE SEA WATER).

d. Preparation of yeast for treatment of latrines.

- (1) Ingredients for preparation of one gallon of potato ferment.

1 lb potatoes  
1/4 lb flour  
1/4 ounce salt  
1/2 ounce compressed yeast  
1 gal of water

EXHIBIT A

(2) Manner of preparation.

(a) Clean the potatoes thoroughly, cut, and boil in sufficient water to cover potatoes. When well done, strain (retain potato water to serve as part of the stock) and mash the potatoes thoroughly. Add flour, potato water and sufficient additional boiling water to make a stiff paste. Mix paste thoroughly. Allow to cool at room temperature. Add necessary water to make one gallon, and 1/2 ounce of compressed yeast. Ripen at room temperature. Solution will be ready to use in from 9 to 12 hours.

(3) Containers.

(a) Two sets of utensils will be used so that one set may be thoroughly cleaned while the other is in use. Containers should be covered during the period of growth.

(4) Reuse of ripe potato ferment to a new batch.

(a) In order to conserve supplies of yeast of which there is a critical shortage, the following procedure will be rigidly followed:

1. One pint of each batch of ripe potato ferment will be placed in a sterilized jar, and kept in the ice box until the new batch is started. This amount will be substituted for 1/2 ounce of compressed yeast in the formula, and will serve as the fermenting agent. This procedure can be continued indefinitely unless contamination occurs. In such case yeast must be used.

(5) Requisitioning of yeast.

(a) Yeast will be requisitioned initially and when required, monthly in the following manner:

1. Allowance will be 2 ounces compressed yeast per seat per month.
2. Requirements based upon the above allowance will be reported on the last Saturday of each month with the daily ration request through the ration channels, that is, by unit ration clerks to the headquarters responsible for consolidating the daily ration requests.

3. Issue will be made from commissaries with the regular rations on the following Monday and will be distributed by ration breakdown officers.
4. Unit commanders are responsible for prompt refrigeration of compressed yeast.

2. Mimeograph letter No. 58 and No. 62, this headquarters, 1942, are rescinded.

BY COMMAND OF LIEUTENANT GENERAL BRETT:

/s/ HUGH J. DEENEY,  
HUGH J. DEENEY,  
Colonel, Adjutant General's Department  
Adjutant General.



## Chapter 8

### CONTROL OF INSECTS



#### Insect Control during World War II.

##### a. Mosquitoes.

At the onset of World War II the Panama Canal Department found itself unprepared to properly handle and house the tremendous increase of military personnel required to adequately protect this all important link in the transportation from the east to the west. By the time the outbreak of the war was imminent the vectors of the insect borne diseases commonly found in the tropics had been well established and the steps had been taken to initiate protection of the troops stationed in the Canal Zone. The majority of troops has been quartered in permanent posts which had already been, in part, sanitized, insofar as insect control was concerned.

The chief interest has always been in the control of mosquitoes, the well known vectors of malaria and yellow fever.

During the year 1941 the Medical Department Field Sanitary Force, taken over by the Medical Department in 1920 maintained a force of 3 field inspectors and an average of 168 laborers.<sup>4</sup> This force continued its operations of sanitating all areas except for the outposts where, for security reasons, natural cover could not be disturbed for the purpose of either large scale drainage or filling operations.

During these early days of the War the Control measures used against the bites of our insect vectors consisted chiefly of anti-mosquito sprays in all buildings housing men, anti-mosquito cream, and through mosquito proofing of all buildings in which men lived and worked. The construction of the trans-isthmian highway, the Rio Hata highway and the third locks caused some of our outposts to be in somewhat more precarious situations; breeding areas of our chief malaria vectors were created and were extremely difficult to control as long as the construction remained in progress.<sup>5</sup>

In January 1942 began the emergency influx of large numbers of troops, the first being the 150th Inf., 158th Inf., 159th Field Artillery, and the 301st Balloon Barrage Battalion.<sup>6</sup> The vast majority of these troops were untrained and unschooled in the fundamentals of individual protection against malaria, their prime objective being to defend the Crossroads of the World. In order to carry out the military mission for which they were sent to Panama it was necessary that they be sent to isolated outposts, most of which had to be constructed by the troops, themselves, at the time of occupancy.

An intensive campaign was immediately begun to educate and indoctrinate these troops in the fundamentals of individual protection against the bite of anopheline mosquitoes and to intensify the work done by all mosquito and malaria control agencies. The fruits of these efforts were evidenced by a gradual fall in the rate of primary malaria from 50.3 per 1000 per annum in January 1942 to 28.1 per 1000 per annum in April of that year, with the rate for recurrent malaria remaining almost constant at approximately 10 per 1000 per annum.<sup>7</sup>

In April 1942 field maneuvers were held by the P.C.A.C. extending through May and June, during which the men were sent out to test the defenses of the Panama Canal and during which time they lived and worked under simulated battle conditions. At the same time the Mobile Forces conducted a period of jungle training. Despite the rigid enforcement of the liberal use of anti-mosquito cream, pyrocide-20 sprays to barracks and hutments, and quinine prophylaxis to all men living in other than permanent mosquito proof quarters, the rate among the troops rose to the terrific figure of 223 per 1000 per annum for primary malaria and 25 per 1000 per annum for recurrent. This rate gradually fell to 90.4 per 1000 per annum for combined primary and recurrent in November 1942.<sup>8</sup>

During December 1942 a combat team of approximately 4000 men made up from the Mobile Forces were sent to various camps in the interior for training. Many of these camps were situated near native settlements where a high percentage of the population act as human reservoirs of the disease, malaria, and the density of the vector was high enough to easily promote the very rapid dissemination

of the disease among our troops. In spite of intensive instruction and rigid enforcement of the use of a 1 to 19 solution of pyrocide-20 in kerosene sprayed to the uniforms, the liberal use of anti mosquito cream and the pyrocide spray to barracks and hutments the primary malaria rate skyrocketed to 274.9 per 1000 per annum among these troops, the entire Mobile Force rate for the month of December 1942 being 126.5 per 1000 per annum.<sup>9</sup> During this entire year what repellents were available were used liberally, although the newer types had not yet become available. Stay-Away was used until information was received that the solution was too toxic for use, at which time it was discontinued.<sup>10</sup>

Following the visit of Lt. Col. Paul F. Russell and Dr. Mark Boyd, a plan was promulgated whereby the Coordinator of the Inter-American Affairs would appropriate a sum of money which would be equaled by the government of the Republic of Panama for the purpose of mosquito sanitation. Since the Inter-American Highway must necessarily be maintained under military control, it was felt that the sanitation thus effected would reflect a fall in the malaria rate among the troops stationed in many of our outposts.<sup>11</sup>

During the year 1942 the Medical Department Field Sanitary Force assisted immeasurably in the sanitation of areas with a force of 3 field inspectors and an average of 207 laborers.

In January 1943 orders were issued by the Department Headquarters<sup>12</sup> requiring rigid enforcement, in sanitized areas, of the rigid maintenance of mosquito proofing of all buildings in which men habitually live or work; the liberal use of authorized mosquito repellents; the regular use of freon aerosol bombs twice daily in all barracks, mess halls, kitchens, latrines, recreation halls, and other buildings occupied by troops; prohibition of loitering outside screened buildings between the hours of 1800R and 0630R and the prohibition of fishing between these hours.

In addition, in unsanitized areas the following precautions were ordered; the use of headnet, leggings, and gloves by all military personnel on duty outside of mosquito proof buildings between the hours of 1800R and 0630R; the regular use of bed nets by all military personnel;

spraying every two hours of the clothing of the guards with a 1 to 19 solution of pyrocide-20 in kerosene; the use of freon aerosol bombs in all guard shacks, sentry huts, road blocks, etc. regularly at 1800R, 2300R and 0400R.

In June 1943 an intensive survey was made of all posts, camps and stations in order to outline a program for permanent drainage projects to be completed over a ten year period.<sup>13</sup> By 31 December 1943, fifteen areas had been surveyed and mapped including all permanent stations in the Canal Zone.

During the year the housing program for the troops was completed and the necessity for the use of tents was thereby obviated.<sup>14</sup> All troops were housed in either permanent type concrete buildings or in temporary T/O type barracks and hutments, the mosquito proofing in all of which was maintained by the organizations.

The post engineers and the Medical Department Field Sanitary Force continued to construct and maintain malaria control installations in areas not maintained by individual organizations.

The efforts expended on malaria and mosquito control were greatly awarded by a marked drop in the malaria rate throughout the Department; that for primary being 24.9 per 1000 per annum and for recurrent, 17.7 per 1000 per annum. It is also interesting to note that the primary rate attributable to the areas which remained unsanitized was 17.3 per 1000 per annum, whereas in those areas in which drainage and other work was carried out in an effort toward complete mosquito sanitation, the rate was only 7.6 per 1000 per annum.<sup>15</sup>

During 1944 work on the 10 year program of mosquito control continued, \$280,000 being allocated for the fiscal year 1945 for this work.<sup>16</sup> Since mosquito breeding was known to exist in the unsanitized areas adjacent to permanent military installations thereby creating a hazard to the troops located thereon, it was evident that a system of priorities for the work to be done under this program was essential. With this in mind, all projects were divided into three categories: 1, Immediate need, to be completed within two years, 2, Near future to be completed within five years, and finally 3, Long Range projects which were to be completed within the ten year period of the program. It was to be estimated that the entire cost of the 10 year program as contemplated would approximate \$3,000,000.<sup>17</sup>

The intensive program of mosquito control during the calendar year of 1944 combined with high malaria control discipline, the superior maintenance of mosquito-proofing of all occupied buildings, and the use of the freon aerosol bombs resulted in a further reduction of the

rates for primary malaria. The rate for primary malaria for the calendar year of 1944 was 7.7, the lowest in the history of the Panama Canal Department. The rate for recurrent malaria was 6.8, giving a combined rate for primary and recurrent malaria of 14.5, also the lowest rate ever attained.

A total of \$400,000 was expended during the fiscal year of 1945 for malaria control projects under the Long Range Malaria Control Project. In addition, the Field Sanitary Force installed almost 20 miles of half-round, invert tile which tied in with the projects accomplished by the Department Engineers. A superior standard of malaria control discipline, mosquito-proofing, maintenance, and the elimination of casual water was maintained. This resulted in further reductions in the rate of primary and recurrent malaria. The rate of primary malaria for the first 8 months of the calendar year of 1945 was 4.9, the rate for recurrent malaria for the same period was 3.6. The rate for combined malaria, primary and recurrent, was 8.5. This is the lowest record for the first 8 months of any year since the institution of the Panama Canal Department, and for the first time, the rates for malaria both primary and combined were lower than those for the population of the Panama Canal for the same period.

Work on the mosquito sanitation was started in towns in the interior of Panama along the trans-isthmian highway and the Inter-American highway as a continuing project under the direction of the Chief Health officer, Panama Canal who acts as the coordinator of Inter-American Affairs.<sup>18</sup> It was felt that due to the close proximity of many military installations to the towns in question and due to the fact that many of the towns are visited by military personnel, any reduction in the gametocyte reservoir among the native population would reflect itself in a reduced malaria rate among the military personnel.

Disciplinary measures to protect against the bites of mosquitoes were maintained at a high plane. Special campaigns were instituted just prior to the change of seasons, which are the worst periods of the year for the spread of malaria in this Department. Mosquito proofing was maintained in all buildings used by military personnel at night. Freon-aerosol dispensers were preserved for use in destruction of adult mosquitoes only. The new DDT residual spray was used as an adjunct in the killing of mosquitoes which entered buildings between periods of use of the freon-aerosol dispensers. Repellents were used by all men on sentry or guard duty at night and by all men on duty outside screened buildings at night. All men going on pass are instructed to freely use mosquito repellents. Headnets, leggings, and gloves were used by all men on sentry or guard duty at



Major Marshall L. Pierce, 0513755, Sn. C., Office  
of the Chief Health Officer, Panama Canal.

Capt. Emery V. Smith, 0497933, M.C., Hq. P.C.D.

Capt. John T. Smith Jr., 0235292, Sn. C., Office  
of the Chief Health Officer, Panama Canal.

Capt. Alexander G. B. Fairchild, 0516789, Sn.C.,  
Gorgas Memorial Laboratory.

b. Three reports of this board were rendered relative to  
the test conducted and submitted to the Surgeon General, U.S.A.

- (1) Report of first phase of the investigation, en-  
titled "Airplane Application of DDT" 22 May 1944.
- (2) A second report entitled "Airplane Application  
of DDT for the Destruction of Adult Mosquitoes"  
rendered 7 August 1944.

c. A board consisting of the following named officers  
was convened in accordance with the provisions of letter order Hq. P.C.  
D., 2 December 1944 for the purpose of studying certain aspects of  
malaria control:

Col. Charles G. Souder 04265, M.C., Army School  
of Malariology.

Col. Wesley C. Cox 08914, M.C., Hq. P.C.D.

Lt. Col. Alton H. Saxon 022263, M.C. Sixth Air Force.

Lt. Col. Daniel Bergsma, 0461449, M.C., Hq. C.D.C.

Lt. Commander H. P. Hopkins, (MC) USNR, 15th Naval  
District.

Major W. W. Middlekauf, 044033, Sn. C., Army School  
of Malariology.

Capt. J. F. Hooker, 15641, (MC) U.S.N., 15th Naval  
District.

Capt. Emery V. Smith, 0497933, MC, Hq., P.C.D.

Lt. (j.g.) Barry Commoner, 222737 H, (S) USNR,  
15th Naval District.

Lt. (j.g.) Hamblin H. Crowell, 353681 H, (S)  
USNR, 15th Naval District.

Dr. Herbert Clark, Director Gorgas Memorial  
Institute.

(1) In accordance with verbal instructions, the Commanding General, PCD, test areas were prepared and preliminary determinations of adult and larval populations made in preparation for experimental field tests on a large scale of DDT in various solvents distributed by multiengined aircraft, i.e. a C-47 and a B-25.

The efficacy of the intensive individual instruction and the large scale mosquito control work done by the individual organizations, the Medical Department Field Sanitary Force, and the Division Engineers was demonstrated by a further drop in the malaria rate which, during the calendar year 1944 reached 14.5 per 1000 per annum for combined primary and recurrent malaria, the primary rate being 7.7 and the recurrent 6.8 per 1000 per annum.<sup>22</sup>

During the period 1 January 1945 to 30 June 1945 both dates inclusive, progress continued on the 1 year mosquito control program by the Division Engineers and the Medical Department Field Sanitary Force. The work accomplished by the Division Engineers included the installation of 35,700 linear feet of major ditches with invert concrete sectional tile drains in addition to extensive grading operations at Albrook Field, C.Z. and moderate grading at Fort Kobbe, C.Z.<sup>23</sup> The Medical Department Field Sanitary Force, during the same period installed a total of 63,493 linear feet of one-half round pre cast sectional concrete tile drains.<sup>24</sup>

In an effort to still further reduce the enviable malaria rate enjoyed by this Department in 1944, the campaign of instruction of the troops was continued. Mosquito proofing of buildings continued to be maintained at a very high plane and the use of all individual protective measures was strictly enforced. All cases of primary and recurrent malaria were interviewed and if any break were found in the malaria discipline they were reported to the commanding officers for corrective action in order to prevent a repetition.

On 27 and 28 February 1945, the Pacific Side base of the Medical Department Field Sanitary Force which had been located at Albrook Field since 1931 was moved to Paraiso, C.Z.

In March 1945 Headquarters, 2 Panama Canal Departments published a directive requiring the monthly application of DDT, residual effect, to the walls, screens and doors of the barracks, mess halls, latrines, recreation halls and other buildings used at night by military and civilian personnel.<sup>25</sup> This procedure reduced to a minimum the number of adult mosquitoes in the buildings between the periods of use of the freon-aerosol dispensers.

A board consisting of the following named officers was convened in accordance with the provisions of letter order HQ. PCD, dated 17 March 1945 for the purpose of studying certain aspects of Malaria Control:<sup>26</sup>

Col. Charles G. Souder, 04265, MC, Army School of Malariology.  
Col. Wesley C. Cox, 08914, MC, Hq., PCD.  
Col. Harold E. Schneider, 017828, MC, Sixth Air Force.  
Col. William H. W. Komp, P.H.S., 2294, USPHS.  
Lt. Col. John E. Elmendorf Jr., 0542192, MC, Army School of Malariology.  
Lt. Col. Daniel Bergsma, 0461449, MC, Hq., CDC.  
Lt. Col. Alton H. Saxon, 022263, MC, Sixth Air Force.  
Major Charles L. Pierce, 0153960, Sn. C., The Panama Canal.  
Major Marshall Hertig, 0513755, Sn. C., Gorgas Memorial Laboratory.  
Major Woodrow Middlekauf, 0444033, Sn. C., Army School of Malariology.  
Major Michael F. De Salvo, 0395179, MC, Hq., PCD (Recorder).  
Major William H. Barton Jr., 0455845, QMC, Sixth Air Force.  
Major Lee J. Steene, 0375152, AC, Sixth Air Force.  
Major George W. Hamilton, 0272252, Sn. C., Hq., PCD.  
Capt. Edward J. Odachowski, 01035330, C.W.S., Sixth Air Force.  
Capt. William F. Swager, 01542242, M.A.C., Hq., PCD.  
1st Lt. Prescott A. Sherman, 0529660, Sn. Co., Army School of Malariology.

The investigations of this board are still being carried on and the results of the findings are to be reported to the Surgeon General, U.S.A.

b. Flies.

Flies were not a problem of great importance in the Panama Canal Department, either in garrison or in the field positions because prompt and careful policing of all areas kept the fly breeding at a minimum level.

During the early days of the second World War period a problem in the breeding of flies was anticipated because of the difficulty in the adequate incineration of garbage at the outpost positions, especially during the wet season. This expected difficulty was adequately combated by the use of inclined plane incinerators in outlying positions.<sup>27</sup>

The maintenance, throughout the department of adequate mosquito proofing has also resulted in excellent fly proofing. Pit latrines are used only in field positions and although yeast treatment, not effective in controlling fly breeding, was used, very little breeding was noted. Fly traps were used extensively in pit latrines and the boxes and buildings are maintained in a fly-tight condition at all times.

Garbage rack areas were carefully policed daily. All cans were kept covered when in use. Cans were scrubbed with soap and hot water daily after garbage had been collected. The ground around garbage racks in the field was kept oiled.

Grease traps were skimmed and cleaned daily. All skimmings were burned.

During 1940 and early 1941, while a few horses and the mules of the Pack Artillery and the Quartermaster Pack Trains were in the Department, an occasional fly nuisance would develop due to the use by post gardeners of compost which was not thoroughly rotted, and which was spread heavily on the top of the ground. Immediate action always stopped this breeding.

Fly traps were maintained at all kitchens and mess halls.

c. Bedbugs. Control.

Bedbugs have always created a problem with which the military surgeon must cope, and constant meticulous care

has always been necessary to eliminate these pests from military installations and maintain a low rate of infestation in this Department.

Before the advent of the miraculous insecticide and larvacide, DDT, which has been found to be most effective against these insects, methods of control and eradication were somewhat crude, painstaking, and at times discouraging.

The control measures used by the Panama Canal Department in an effort to keep the bedbug problem at a minimum level all through the second World War until 7 August 1944 were the use of flaming the beds with a blow torch and painting with ten percent cresol and kerosene.<sup>28</sup> The walls and woodwork were treated with the same solution. All infested mattresses and pillows were, at that time, treated by steam, exposure for 30 minutes to dry heat at 140 degrees, or sprayed with the above solution. The necessity of the repetition of this treatment was particularly stressed.

On 24 January 1943 a directive was circulated to all medical officers from the office of the Department Surgeon outlining the following program for the control of these insects.

Individual: (1) Each man should examine his bed linen, blankets and mattress daily for the presence of bedbugs. The tufts in the mattress, the turned rool and the edge of the mattress and the corners of the mattress should be carefully examined.

(2) Each man should empty his foot locker, barracks bag, and wall locker weekly and search for bedbugs. They will be found in clothing, especially under coat collars, beneath pocket flaps and in the folds of little used folded cloths. Footlockers should be carefully searched for they will hide in the corners of the lid, especially if the lid does not fit tightly. They will also hide in the louvers of the wall locker in the slip loop of barracks bags, in gas masks and gas mask containers.

Methods of Eradication: (1) Fumigation:

(a) Hydrocyanic acid gas is the most effective bedbug control measure when feasible. Especially trained personnel equipped with special hydrocyanic acid gas proof masks are required. Buildings should be tightly

sealed and should be separated by at least 25 feet from any other building. In no case should fumigation with hydrocyanic acid gas be undertaken by persons untrained in its use. Directions for the use of hydrocyanic acid and related compounds are set forth in Military Preventive Medicine, Third Edition, Page 828 to 831.

(b) Sulfur Dioxide: This is much less dangerous to use than cyanide. Sulfur dioxide must also be applied in the presence of ample moisture. Three pounds of sulfur per 1000 cu. ft. of air space should be used. The sulfur should be burned in a deep iron pot. Sulfur dioxide will not penetrate deep cracks or reach bedbugs hidden behind wall paper. In order to kill all bugs and eggs, sulfur fumigation should be repeated three times at three day intervals.

(c) Liquid Insecticides:

Liquid insecticides are effective if sprayed into cracks, springs, bed corners, painted or sprayed on tufts of mattresses, the rolled edge of mattresses and the corners of the mattresses. The following are excellent liquid insecticides for the elimination of bedbugs:

I Kerosene containing 10% cresol.

II Kerosene containing 5% cresol and 5% turpentine (dissolve the cresol in the turpentine and add the mixture to the kerosene.)

III Kerosene.

IV One part pyrocide-20 or equal dissolved in 10 parts of kerosene. (Pyrocide is 20 times concentrated extract of pyrethrum.)

The above liquids must be forced into all cracks and crevices where bedbugs are likely to seek protection and lay their eggs. Metal beds and wooden articles may be liberally painted using a fine flexible paint brush. Mattresses may be sprayed or painted, care being taken to make certain that all breeding places are penetrated.

(d) Steam Sterilizing: Mattresses and other articles except woolens and leather can be freed of bedbugs by the use of a steam disinfecter if available.

(e) Use of the blow torch: The joints and other openings in metal beds, and cracks and crevices in masonry, brick or cement walls can be disinfested by flaming with a blow torch. Care must be used when treating bed springs in order not to take the temper out of the springs.

#### General Principles in the Control of Bedbugs:

- (1) Inspect barracks weekly.
- (2) If barracks require treatment, treat entire barracks the same day.
- (3) Air mattresses in the sun each day if possible.
- (4) Daily inspection for bedbugs of his own bed by each man.
- (5) Weekly inspection by each man for bedbugs of his foot locker, wall locker, and barracks bag.
- (6) The use of liquid insecticides as a preventative measure.

Because of the open type of construction of almost all buildings in this Department, fumigation of any type is very impractical and is never used. However, the other control measures remained in effect and fairly well controlled the bedbug problem. There continued, nevertheless, numerous instances of isolated infestation.

On 6 May 1944 a recommendation was made that the new larvacide, DDT, powder, dusting, being effective in the control of bedbugs, be issued on the basis of 25 pounds per 1000 men per month in order to determine its efficacy and, more exactly, the amounts needed.<sup>29</sup>

The receipt, in the Department, and the issue of the new insecticide spray, DDT, residual effect, in the form of a five percent mixture in kerosene was a great aid in the beginning of a really effective campaign in not only reducing the bedbug population, but, where properly used, the elimination of the problem entirely.

On 7 August 1944 a directive was published by Hq. PCD describing the action of DDT and its toxicity to human, requiring that it be used in the following manner for the control of bedbugs:

"The use of 250 cc. of insecticide per bed (including mattress, pillow, springs, and bed frame) has been shown to kill all bedbugs. Bedbugs introduced experimentally on treated beds about six months after such treatment were killed by the residual action of the DDT. Three and one-half gallons of insecticide should prove adequate for a seventy man barracks. The recommended technique is as follows:

"1. All clothing, rubber material and other objects to be protected from kerosene should be covered or removed from the barracks.

"2. Workers should wear filter type masks or moistened fine gauze masks over the nose and mouth.

"3. Mattresses should be placed in piles of eight to ten each. Bunks if moveable should be placed on end along the wall so that excess spray will fall on the walls.

"4. Spray should first be applied to the outside surfaces of the pile of mattresses. Then the man operating the sprayer should apply the solution to one side of the top mattress, his assistant quickly turning it over to be treated on the other side, then moving it away while the sprayer begins on the second mattress. A slight moistening of the surface is all that is required; a few minutes after the spraying the kerosene will have partly evaporated, leaving visible small DDT crystals adherent to the surface. Pillows should be treated in the same manner.

"5. A rapid spraying of springs and bed frames should follow, the spray being directed toward the walls in order that the excess spray may be deposited on them. If this is done, direct spraying of these surfaces will not be necessary. Otherwise walls of buildings should be sprayed lightly.

"6. Smoking in the room should be prohibited until the following morning."

The above program has been in effect to the present time and has proved effective in completely ridding barracks of these pests and

maintaining them free of infestation. In the few isolated cases of infestation that have occurred, all evidence has pointed to a break in the above ordered control measures. These infestations have been quickly and completely eliminated upon discovery by the proper application of DDT, residual effect.

d. Sandflies.

Sandflies have been a problem in the Panama Canal Department, not so much from the standpoint of a health problem as from the standpoint of lowering morale. At many locations in the Department, sandflies may be observed literally in swarms.

Since the breeding of this insect pest requires water, the efforts expended to control malaria also helped, in part, to reduce sandfly breeding, although nothing has been done to control their breeding as such.

Very little was done to either control or protect man from these pests until November 1942 when, as is written in a letter from Col. Wesley C. Cox to Lt. Col. William S. Stone, Office of the Surgeon General, dated 28 November 1942, pyrocide-20 used experimentally as a spray to the clothing to test the efficacy of its repellent action. Reports were sent to the Office of the Department Surgeon each month from all positions noting the number of men sprayed, the number bitten, and also any irritating effects noted from the use of the solution. The results were very encouraging, and both sandfly bites and mosquito bites were markedly reduced.

In January 1943 the spraying of the clothing of the guards with either the pyrocide-kerosene spray or with freon aerosol dispensers at two hour intervals became an order from Hq. PCD as did the regular and periodic spraying twice daily of all buildings occupied by troops with freon-aerosol dispensers.<sup>30</sup> These measures were primarily used for malaria control, but since pyrethrum also proved effective in killing adult sandflies, protection from these insect pests was incidentally obtained.

The measures thus far used as protection against sandflies were greatly augmented when a supply of DDT was received in the Department and on 7 August 1944, Hq. PCD published a Mimeograph Letter which required the spraying of walls, light cords and doors with the insecticide.<sup>31</sup> It was not until 27 March 1945<sup>32</sup> that a sufficient supply of

the DDT solution became available for the inclusion of all screens to be sprayed once each month. This procedure is being followed to the present time and is proving to be very efficacious in the protection against sandflies as well as mosquitoes and flies.

e. Cockroaches.

The Panama Canal Department, as most other warm damp climates, is scoured with the presence of relatively large numbers of cockroaches which, if any semblance of control is to be maintained, require constant and meticulous attention.

During the early years of the second World War, the chief means of control of these pests consisted in the rigid enforcement of strict sanitation, maintaining all area, particularly kitchens and mess halls in a scrupulously clean state at all times, thereby denying access of roaches to any supply of food. To accomplish this end, surgeons of camps, stations, and units are charged with the duty of frequently and regularly inspecting kitchens and mess halls of the organizations for which they are responsible. These inspections are made to maintain excellent general sanitation including the following points:

- a. Storage of food so that it is inaccessible to roaches.
- b. Proper garbage disposal.
- c. Cleanliness of table tops and utensils, keeping them free from accumulated grease.
- d. General cleanliness of the mess hall and kitchen. Inspections are made by surgeons and medical inspectors of the various tactical commands and also of the Department.

To augment the maintenance of strict general sanitation, various roach poisons were used, depending largely upon those which were available. The poisons most commonly used were the issued insecticide, powder, roach, powdered borax and yellow phosphorus.

Pyrethrum compounds have proved to be very effective

in killing cockroaches, and so in January 1943,<sup>33</sup> when the general use of pyrocide-20 in kerosene and freon-aerosol dispensers in kitchens, mess halls, barracks, latrines, recreation halls and other buildings was ordered, primarily as a malaria and mosquito control measure, the augmentation of cockroach control was greatly enhanced.

The above control measures remained in force until 7 August 1944<sup>34</sup> when a sufficient supply of the new insecticide, DDT, was received and issued throughout the Department to require spraying at monthly intervals in all buildings. DDT, while apparently not as effective in killing cockroaches as many of our other insects such as mosquitoes, flies, bed-bugs, and sandflies, has proven the most effective poison used to augment the maintenance of strict sanitation. Frequent inspections by medical officers have been continued to the present time, any defects being reported to the Commanding Officer of the organization for corrective action.



## Chapter 9

### CONTROL OF RODENTS

Rodents were not a problem of great importance in the Panama Canal Department during the World War II period, 1 January 1940 to 1 October 1945, either from the standpoint of the spread of disease, the destruction of property, or the lowering of the morale among troops. Only in occasional isolated instances have rats or mice appeared in numbers to be of any consequence, and these were effectively controlled by means of proper protection of foodstuffs in conjunction with programs of trapping and poisoning.

Prior to 1941 a high percentage of troops were housed in well constructed permanent type buildings of concrete and steel construction. This type of construction is not conducive to the harboring of rodents, and so the control of these pests had, until that time, been rendered relatively simple. However, with the onset of the War and its consequent influx of large numbers of troops for which the housing was totally inadequate, a program of building was necessitated. Temporary buildings were constructed which, because of materials available and the necessarily temporary type of construction used, were not rat proof. The practice of placing the first floor of the buildings on pilings well above the ground level was an aid in preventing rat infestation. The construction of temporary buildings in conjunction with the large numbers of civilian laborers employed who were in no way careful in the matter of proper police tended to cause a noticeable rise in the rat population.

On 2 August 1942 a directive was published by Hq. PCD<sup>35</sup> explaining that an increase of the rat population had become evident and the necessity for control. In order to effect a control the following program was instituted:

#### a. Reduction of Food Supply.

Strict enforcement of the following measures will result in a minimum food supply available rats: consumption of lunches only in areas set aside for this purpose and provided with garbage cans having tight fitting lids in which remains of lunches can be disposed; and strict police of lunch areas daily; all garbage can stands to be elevated 24 inches above ground level. Area for 10 feet in either direction about garbage can stands to be of concrete, firmly rolled crushed rock, firmly rolled gravel or puddled clay; all garbage cans to be provided with tight fitting lids which will be

kept in place except when garbage is actually being placed in can; careful handling of garbage to prevent spilling on ground; daily removal of garbage; all trash to be deposited on racks elevated 24 inches above the ground with careful separation to prevent any garbage being placed on trash rack; rat-proofing of all kitchens, mess halls and food storehouses or store rooms; where rat-proofing in kitchens, mess halls and food storehouses or store rooms was impossible, all food was placed on dunnage not less than 24 inches above the floor and not less than 24 inches from any side wall.

b. Poisoning.

Poisoning is an effective means of rat control. Not all rats in a locality will be killed and those which survive will soon become educated so that they will not take the poisoned bait. This can be overcome by distributing a large number of baits at one time and alternating the type of bait used. The common rat poisons used were red squill, (flue or oven dried) barium carbonate, arsenic, phosphorus, and strychnine. Methods of preparing and setting out poisoned baits are set forth in paragraphs 184, 185, 186, and 187 of FM 8-40, Medical Field Manual, Field Sanitation.

c. Trapping.

Because of the labor and skill required if trapping is to be effective, this method of rat control should be restricted to warehouses and storerooms. The types of traps, trap baits, and methods of trap setting are given in paragraph 189, 190, and 191 FM 8-40 Medical Field Manual, Field Sanitation.

d. Elimination of Rat Harboring Areas.

Rats will burrow under concrete walks, concrete slabs, and foundations of buildings laid on the ground. Since rats do not burrow to a depth of 24 inches, solid foundations 24 inches below ground level will give protection against rats. All lumber, pipe railroad iron, oil drums and other material stored in the open should be placed on dunnage not less than 24 inches above the ground level. Rat harborages will not be created under material stored in this manner. Buildings built on the ground may be rat proofed by filling between the studdings with concrete or bricks and mortar to a height of 24 inches.

e. Survey of Problem.

The continued enforcement of the above precautionary measures against rat infestation kept the rodent problem well under control as was demonstrated by a survey made during March and April 1945 in compliance with Ltr. SPXMP-M 729.5, Hq. ASF, dated 14 March 1945; a copy of the body of the report follows:

1. Areas in which rodents are a problem.

- a. Fortunately at the present time rodents are sufficiently controlled so that they do not constitute a problem anywhere in the Department as disease carriers, through destruction of supplies or equipment or by depressing the morale of troops. The absence of actual hostilities and the relatively stabilized tactical situation in this theater throughout the war period had permitted the development and the continuation of the rat control program without interruption... (and)... no destruction of property with its concomitant production of increased opportunities for rodents to obtain food and shelter as has occurred in more active areas. The proximity of extensive port facilities to a great many of the installations of this Department, the variety of species found in this locality and the presence in the vicinity of native populations uninformed on the prevention of rodent infestation make this vector an ever present potential source of disease. However, no station reports any evidence present of any disease which can be specifically traced to rat infestation. Rodents which have been caught have been examined for disease bearing lice or fleas and none have been found.
- b. The destruction of Army supplies and equipment throughout the Department is minimal. At many stations none whatever have occurred. Probably the most commonly found infestation has been in the warehouses and when it occurs at all, has been very minor. In a few instances minor infestation was reported in some other warehouses, a bakery, restaurant, supply office, commissary, or dock.

c. No station found any deleterious effect upon the morale of troops as the result of rodent infestation. The experience of this office supports the view that the slight rodent infestation in this Department had no effect on morale.

2. Pertinent information.

a. Species of rodents.--Rodents found in this area are the black rat (*Rattus rattus rattus*), the brown or roof rat (*Rattus rattus alexandrinus*), the Norway rat (*Rattus Norvegicus*), the house mouse (*Mus musculus*). The field mouse and the opossum have been reported in this survey. Of these, the black rat is the most common and the brown rat and opossum the least common in occurrence.

b. The total degree of infestation is reported as minimal throughout those stations which have reported any rat infestation.

The number of posts reporting infestation in various degrees and the percentage of the total reporting each degree of infestation is set forth in the table below:

Degree of Rat Infestation on Posts

<u>Degree</u>	<u>No. of Stations</u>	<u>% of Total</u>
None	2	6.90
Minor	26	89.65
Moderate	1	3.45
Grave	0	0.0
Total	29	100.0

c. Food sources for rodents on the posts of this Department consist entirely of storage spaces in old warehouses of the store rooms of certain retail stores, a restaurant and one bakery, all located in old buildings. Strict discipline is enforced at all times in respect to:

- (1) Keeping garbage and trash cans tightly covered.
- (2) Incineration or other disposal of the garbage and trash and,
- (3) Prohibition against depositing any food and garbage on a dump.

All dumps are carefully maintained with incineration of all combustible trash occurring daily. Every effort is made to have buildings kept in a rat proof condition. Most of the warehouses and store rooms storing food now keep it on dunnage or shelves at least 2 feet off the ground to prevent rats from jumping up on it.

There are many other potential sources of rodent infestation such as messes, soda fountains, restaurants, commissaries and beer parlors but by constant control these are prevented from becoming actual sources.

d. Habitat and Shelter.--The infestation of the posts and stations in this Department exists almost entirely in warehouses and store rooms where the rats live in burrows under the concrete slab of the former or between the surface of the double walls in some of the latter. In certain field positions field mice have been found living in burrows which are under the temporary buildings installed at the positions or run laterally from the walls of the adjacent trenches and foxholes.

3. Summary of Survey and control Measures.

a. Rodent Surveys.

(1) It is customary for all Surgeons in this Department to make an inspection of the entire area in which they have the responsibility of reporting upon sanitary conditions at least once each week. This includes constant attention to the prevalence of rodents. When signs of infestation are found, the installation is studied carefully and recommendations are instituted for a rat control program which will overcome the current infestation and prevent future inroads. In cases where the problem becomes too complex for solution by ordinary measures, the services of an officer with wider experience in rodent control technique are used. In addition to the regular inspections made by the surgeons of all posts, stations, and units, periodic inspections are made by the surgeons and

medical inspectors of the various tactical commands and of the Department. These include a search for the prevalence of rodents and recommendations for their control. A special study of the prevalence of rodents has been made recently throughout the Department in order to provide accurate current data to form the basis of this report.

(2) Frequent periodic checks are made of trapped rodents to determine the presence of disease bearing ectoparasites. Any rodent found dead other than in a trap is sent to the Board of Health Laboratory for autopsy and culture if required for the presence of disease. Nearly always such deaths are the result of poisoning or attack by other animals, but this fact is determined by investigation and not assumed.

b. Control of Rodents.

(1) Constant supervision of the care of dumps, incinerators and garbage racks and cans is a part of the program of every surgeon and medical inspector in this Department. It can be stated that rats do not exist at the dumps within this Department. It's police of garbage racks and surrounding areas and the scrubbing of cans as well as maintenance of tight fitting lids is given constant attention and the results are satisfactory in all units most of the time. As lumber or metal pipe can be obtained dunnage and shelves are added to the equipment of those warehouses which do not already have a sufficient amount of them. This is constructed in such a manner as to keep attractive food supplies at least two feet off the floor and to provide no intermediate jumping platforms between the floor and the lowest shelf. In nearly every case loose food supplies such as grains, flour, beans, sugar, crackers, bread and pastries are kept in metal cans or within fine mesh metal screening enclosures. Solid concrete slabs with concrete walls extending at least two feet below the ground level are used in all warehouses now being built for storage of food products. Floors where food

is distributed, cooked, served or eaten are scrubbed with soap and hot water daily. The field sanitary force of the Medical Department aids in the eradication of rodents in Post Exchanges and warehouses in cases where local facilities at the stations are not adequate to provide complete control.

- (2) The concrete construction used in most of the permanent buildings to prevent destruction by termites serves also as a great blockade against rodent infestation. In the buildings of temporary construction, the absence of basements and the practice of placing the first floor on piles well above the ground level is another effective aid in reducing the possibility of access to the interior of the buildings. Elevation of lumber piles on dunnage or racks with separation from side walls and floor removes much potential shelter of that type. Rat holes and potential rat runs in buildings are closed using metal or brick and concrete. Double wall construction is avoided. Metal or metal facing is used in the construction of warehouses and supply room doors.
- (3) Poisoning is employed in some installations in the Department. The bait most commonly used consists of some form of meat, usually ground. Occasionally cereal is used. In some instances pre-baiting has been accomplished. The poisons used consists of barium carbonate or chloride, red squill, arsenic and 3% phosphorus.
- (4) Trapping is used very extensively in the store rooms, warehouses and restaurants. The spring trap is the type employed almost universally in this area. Prebaiting is also frequently used in this type of control.
- (5) Fumigation is not feasible in this area because of the open type construction of the buildings. It is never used.

c. DDT is used extensively in the control of mosquitoes, sandflies, bedbugs, roaches and other insects in this Department. It is possible that it may effect certain ectoparasites which exist on the rodent but no deliberate attempt to eradicate ectoparasites by this method has been considered necessary in this region.

4. Summary.

The control of rodents in this Department has been essentially the problem faced in this region in normal non-emergency circumstances. Any increase in its size had been a simple arithmetic rise in proportion to the increase in the number of installations and supplies. The type of construction used in the tropical areas assists in the control and the reduction of the number of rodents. The present state of sanitary discipline is high and this is effective in denying sources of food and shelter. Regular and periodic inspections are made to determine the presence of rodents and rat proofing measures accomplished where indicated. Minor incidental infestation is controlled by poisoning and trapping.

## Chapter 9 A

### CONTROL OF SNAKE BITES

Snake Bites during World War II - Prevalence and Preventive Measures. --In order to understand any of the facts concerning the history of snake bites among military personnel of the Panama Canal Department during the second World War period, 1 January 1940 to 1 October 1945, set forth relative to the snakes found in this area, and the incidence of snake bites and deaths due to them among the native population, it will be very advantageous to take into consideration the scientific snake survey conducted by the Gorgas Memorial Laboratory during the period January 1929 to September 1945.

In order to obtain a satisfactory number of snakes to adequately determine the snake fauna, a bounty was offered on all snake heads with a few inches of neck which were sent in for identification. These were placed in tanks of formaldehyde located at all farm centers. Identification was accomplished by Dr. Thomas Barbour of the Museum of Comparative Zoology, Harvard University, Dr. Afranio do Amaral, Serum-Therapeutic Institute of Brazil, Mr. Arthur Loveridge of the British Museum and Prof. E. R. Dunn of Haverford College.<sup>36</sup>

Fifteen species of poisonous snakes were encountered during this survey. These snakes are as follows:<sup>37</sup>

- (a) Fer de lance (Bothrops atox). This is the most common of the venomous snakes, and it offers the greatest medical hazard. Practically all snake bite accidents in which it has been possible to secure the snakes for identification have been caused by this snake.
- (b) Hog-nosed vipers: There are two of these. The species found on the Pacific Slope are Bothrops lansbergii, on the Atlantic Slope, Bothrops nasutus.
- (c) Tree vipers: The commonest of these is Bothrops schlegelii. It is found all over the country even up to altitudes of 4000 feet, but it is more common in the lowlands. Bothrops lateralis and Bothrops nigroviridis have been collected from the coffee plantations in Chiriquí at elevations of from 3000 to 4000 feet. No fatal accidents have been reported due to these vipers in Panama.
- (d) Mano de piedra, timbo, or jumping snake, Bothrops nummifera is represented by two specimens taken at elevations of about 2000 feet in the upper basin of the Chagres River. This is a very dangerous snake, but there is no record, locally, of accidents due to it.

(e) Godman's viper or Bothrops Godmani: This is a ground species and all specimens taken thus far have come from the banks of streams at the coffee growing levels of Chiriqui.

(f) Bushmaster, Lachesis mutus: This is the largest viper in the collection. It is most common in the rocky, forested regions, but is also found in the lowland plantations where rodent life is abundant. It has a very low incidence and to date no authentic record of an accident has been found. Many accidents have been attributed to it but in those cases where the snake was available for identification it always proved to be the fer de lance.

(g) Coral snakes, Micrurus nigrocinctus nigrocinctus is by far the most common of the coral species found at all levels. Others collected were Micrurus mipartitus, Micrurus disolencus dunni, Micrurus Clarki and Micrurus nigrocinctus coibensis. We have record of three accidents due to the first named of these coral species, but none of them were fatal.

(h) Sea snake or Pelamydrus Platurus: This species of snake was represented in the collection by four specimens all of which were taken on the shore at tidewater level.

(i) Five more species have been reported for Panama, but have not been included in the catches made in connection with the census made by the Gorgas Memorial Laboratory. These species are:<sup>39</sup> Micrurus Nigrocinctus mosquitensis; Micrurus sp. (from El Valle); Micrurus stewarti; Micrurus sp. (from San Blas); Bothrops or Trimiresurus monticelli (from Cana).

The following table indicates the percentage of the total of the various venomous species of snakes captured and identified during the period January 1929 to September 1945 (totalling 13,343 snakes);

<u>Species</u>	<u>Number</u>	<u>% of total of 13,343</u>
Fer de lance .....	1257	9.4
Hog nosed viper .....	1090	8.1
Coral .....	568	4.2
Tree vipers .....	127	0.95
Bushmaster .....	124	0.09
Godman's viper .....	12	0.03
Sea Snake .....	4	0.03
Timbo .....	2	0.015
Total	3184	23.8

It is very interesting also to note that the snakes in this area do not coil up into a high pile and strike from that position as do many of the North American species, but generally form an S-shaped figure on the ground. Their heads are usually over 6 to 10 inches in distance. This offers an explanation for the fact that a very high percentage of snake bite accidents occur on the fingers, hands, forearms, toes, feet and lower legs. A review made by Dr. Herbert C. Clark lists the anatomical location of 104 snake bites in the following table.<sup>40</sup>

<u>Upper Extremities</u>	<u>Lower Extremities</u>
Fingers .....	Toes .....
Hands .....	Foot .....
Wrist .....	Ankle .....
Forearm .....	Leg (below knee) ....
Shoulder (tree viper). 1	Thigh .....
Total	50

\*Bitten while in a squatting position.

Considering the number of snakes of venomous species found in Panama and other Central American countries, the number of fatal snake bite accidents appears to be amazingly low, even among the natives who live in the interior in contact with them most of the time. Dr. Herbert C. Clark compares deaths due to snake bites to those due to lightning in the following statement of statistics:

"Over a period of 3 years in one large river valley of Central America there were 3 deaths due to lightning and 3 due to snake bites. Local Ancon, Canal Zone, records from 1904 to 1944 show 7 deaths due to lightning and 5 due to snake bites. Our own 14 years of experience with the people of the Chagres River towns shows 3 deaths due to snake bites, and 2 due to lightning. A consolidation of these figures show 12 deaths due to lightning as compared with 11 due to snake bites."

Of the 104 cases of snake bite accidents which were previously reviewed relative to the anatomical location, 7 deaths occurred representing a mortality rate of 6.73%.

The explanation offered for the low mortality rate among the bites of snakes whose venom is deadly is that these poisonous snakes are nocturnal in their habits. Food is plentiful through the year and so they are able, any night, to capture and swallow a rodent. In so doing they discharge all the venom that can be squeezed out of the

glands. Since it requires some time, approximately 2 weeks, for the snake to refill the glands so they are at maximum toxicity and since the majority of human contacts with snakes occur in the daylight hours, their chances of being bitten by a snake with full poison glands is very much reduced. Most snake bite accidents occur in the daytime and in most cases the snake is full of food or it would have made its escape. Being full of food the belly plates are stretched tightly rendering running away very difficult. Baby snakes, too, are particularly dangerous since they are frequently unable to find suitable food at night and are consequently required to extend their search during the daytime. Their glands, at this time, are full and consequently their bites are particularly hazardous.<sup>42</sup>

As uncommon as fatal snake bites are in this area under normal conditions it was fully realized that under Wartime conditions with jungle training, maneuvers etc., men would be exposed, to a much greater extent, to the bites of snakes and since the use of the anti-venin is of immediate necessity supplies of Anto-Lachis venin was received and shipped to the Post Dispensary Quarry Heights for emergency issue to Pacific Side positions,<sup>43</sup> and to the Medical Supply Officer PAGD, Fort Davis, C.Z. for issue to Atlantic Side position.<sup>44</sup> Since the anti-venin deteriorates with age and because of its expense it was not stocked in all field positions, but only in the above locations to be issued as needed.

On 6 May 1941 a letter from the Surgeon, Quarry Heights to the Department Surgeon, P.C.D. indicates that the following anti-venin was being kept on hand.<sup>45</sup>

Anto-lachis (anti-bushmaster)	7 amps.
Anti-venin, bothropic for Crotalus Terrificus	4 pkgs.
Anti-venin, cascabel for Crotalus Terrificus	1 pkg.

First Aid Treatment in case of Snake Bite. - The first aid procedures which were followed throughout the Department were those contained in FM 13-30, 15 December 1941, and FM 72-20, 27 October 1944. Prior to the publication of these field manuals, the following first aid measures were published locally for use in this Department.<sup>46</sup>

First: Apply a tourniquet a few inches above the bite. For this purpose use a piece of rubber tubing, a rubber garter, a handkerchief, cord or even shoe string. Do not bind too tightly. To prevent gangrene or destruction of the flesh, it is important to release the tourniquet every 10 to 15 minutes, for about a minute at a time. The one who applies the tourniquet should remain with the patient and accompany him to the airplane, ambulance or hospital keeping "time" on the tourniquet.

Second: Cut tissues (1/4 to 1/2 inch deep) with a sharp knife crossing each fang puncture and from one to the other, allowing the wound to bleed freely.

Third: Suction, if necessary to insure bleeding, preferably with a special apparatus. Should one undertake to do this in the field he must be sure that no mouth or lip cut or sores exist.

Fourth: If patient becomes dizzy, prepare a solution of aromatic spirits of ammonia (1/2 teaspoon in water) for him to drink. Coffee can be given.

Don'ts: Don't run or get overheated. Don't take any alcoholic stimulants. The circulation of the blood is increased by exercise or use of alcohol, and serves to distribute the poison much more rapidly through the body. Don't injure the tissues by using or injecting potassium permanganate which is now known to be of no value as an antidote. Don't cauterize the site of the bite with strong acids or the like.

Hospital treatment is summarized as follows: The patient is given undivided attention, bleeding by further incisions, suction, wet dressings, colonic irrigations, supporting measures, intravenous use of glucose solution and blood transfusion, all depending on the condition of the patient at the time. Gas bacillus and tetanus antitoxins are to be used.

Anti-venin: (Snake bite serum). Specific anti-venin is used as soon as possible when available, whether in the field or at the hospital.

The uniform regulations required the use of shoes, leggings and gloves, primarily as a malaria control measure and to protect the legs from the thorns and bushes encountered in the jungles. The use of these precautions may have aided materially in the low number of snake bite accidents incurred by military personnel located in the Panama Canal Department during the second World War since it is extremely difficult for a snake to penetrate, with its fangs, the heavy canvas of the issued leggings and, certainly, the leather of the issued high shoes.

Despite the fact that the snake population of Panama is high and the percentage of poisonous snakes reaches almost 25% and despite the fact that troops in many of the outlying positions were exposed almost constantly to contact with snakes, there are no records of bites by poisonous snakes among the military personnel of this Department during the period of the second World War period.

Chapter 9 B

ANTI-BIOLOGICAL WARFARE

A Panama Canal Department Anti-Biological Warfare Officer was appointed on 27 May 1944,<sup>47</sup> and the activities of this officer were carried on after that date in accordance with War Department directives.<sup>48</sup>

a. Blocked Nationals.--The proclaimed lists of certain Blocked Nationals in the Republics of Panama, Costa Rica, Nicaragua, Guatemala, Ecuador and Peru have been carefully studied. No purchases from any firms on the proclaimed lists have been made by the Department Quartermaster, unit messes, post exchanges, concessionaires or U.S.O. Clubs.

b. Inspections.--Between 27 May 1944 and 9 June 1945, a total of sixty-nine business companies who sold, handled or delivered foods or beverages to individuals, organizations, post exchanges, concessionaires, officers' messes and U.S.O. Clubs were inspected. One firm, the La Estrella, Panama City, manufacturing paste products is still being inspected in an effort to bring them up to the proper sanitary standards.

Beer and Soft Drink Manufacturers.--The brewery in Panama City with branch in Colon is inspected at unannounced periods. The security and sanitary provisions are satisfactory.

The three soft drink manufacturers in the cities of Panama and Colon are inspected at unannounced periods. Security measures, especially those relative to the syrup rooms have been brought to a satisfactory level. The sanitary conditions are maintained at a satisfactory standard. Constant inspections are required because of the chance of failure in proper bottle washing methods. The number of bottles which are found upon delivery to contain extraneous matter such as paper or cigar or cigarette butts has been reduced to a minimum. Investigations have always shown that such failures are due to poor inspection by tired personnel and that the basic wash process is correct. Bottle inspectors are now given a rest after each fifteen minutes of work. Complete liaison is maintained with the Health Department, the Panama Canal. The nationally known soft drinks such as Coca-Cola, Orange Crush, Pepsi-Cola, Canada Dry are manufactured from syrups prepared in the United States. Sugar, water, carbon dioxide, and, in the case of Orange Crush, oranges are obtained locally. The water supplies used by the manufacturers are potable.

The Coca-Cola manufacturing plant in San Jose, Costa Rica has been inspected for sanitation and security. This plant is in excellent condition.

The Coca-Cola plant in Guatemala City, Guatemala, has been inspected. The sanitation is satisfactory. The security investigation is being carried out.

The brewery at Guatemala City, Guatemala, has been inspected. The sanitation and physical security is satisfactory. The security investigations are being carried out.

The local soft drink plant at David was inspected. This plant does not sell to any organization, post exchange, officers' club or concessionaire. The local U.S.O. Club has been closed since December 1944.

Milk.--The pasteurizing plants of the Compania Ganadera Industrale, Aguadulce, R. de P., The Suavel Company, Panama City, the Planta Pasteurizadora, Managua, Nicaragua, the Roberts Dairy, San Jose, Costa Rica, Sharpe & Co., Guatemala City, Guatemala, and Tagaropolous Company, Colon, R. deP. have been inspected. The Plants of the Compania Ganadera Industriale, Aguadulce, R. deP., The Suavel Company, Panama City, Tagaropolous Company and the Mindi Dairy, Colon, R. deP., passed the sanitary and security inspection. The raw milk delivered to the Tagaropolous Company was not of satisfactory quality and this milk supply was, therefore, declared unsatisfactory because of sanitary deficiencies. The raw milk delivered to the Planta Pasteurizada, Managua, the Sharpe Company, Guatemala City, and the Roberts Pasteurization Plant, San Jose, Costa Rica was obtained from herds which were not T.B. tested. Tests by the government veterinarians revealed that tuberculosis cows were present in all of these herds. The milk from these companies was, therefore, declared unsatisfactory for use because of sanitary reasons. In these instances Anti-Biological Warfare was not mentioned and sanitary reasons for not approving the milk for military use were given. The commanding officers and surgeons in question were notified that these milk sources could not be used.

The milk barns, milk houses and the pasteurizing plant of the Compania Ganadera Industriale, Aguadulce and the Suavel Company, Panama City are regularly inspected. Frequent bacteriological examinations are made. The cattle are T.B. tested annually.

The Mindi Dairy is operated by the Panama Railroad. The production of milk is under the supervision of the Health Department, The Panama Canal. The pasteurization and bottling plant is located at the Mount Hope Cold Storage Plant. Approximately eight hundred gallons of milk are supplied to messes, post exchanges and concessionaires daily. No milk is supplied to officers' clubs. Military personnel messing separately may obtain one quart of milk daily on special prescription only. All cattle are T.B. tested, the milk is delivered from the barns to the plants in government operated trucks and is delivered from the plant to the using agencies in government operated trains and trucks. All personnel are security tested. The barns, milk houses and pasteurizing plant are excellent in regard to sanitation and security.

All Anti-Biological Warfare security measures are properly enforced at these plants. The Compania Ganadera Industriale furnishes approximately eight hundred gallons of milk daily for use in military messes. The milk is transported in sealed cans and in sealed refrigerator trucks of the United Motor Freight. The Suavel Company sells to post exchanges, officers' clubs and concessionaires. Approximately two hundred fifty gallons of milk is sold daily. It is delivered in quart and fifth bottles by the company direct from the plant to the receiving agency.

Ice Cream.--Ice cream is now obtained from the Panama Railroad Plant at Mount Hope and the post exchange only. The Suavel Company ceased to supply ice cream to any military agency 1 January 1945. The ice cream prepared at the Mount Hope Plant is wholesome and of low bacteria count. The plant is excellent in regard to sanitation and security. The finished product is delivered to the using agencies in government operated trains and trucks.

Post Exchange Ice Cream. The manufacture of ice cream by the post exchanges has been centralized and is made entirely from prepared mixtures imported from the United States. Centrally located exchanges on the Atlantic and Pacific sides manufacture all ice cream used in these areas. All security measures have been taken. The ice cream is delivered to using exchanges in post exchange operated trucks, by government operated planes and by military vehicles. At outlying stations such as Rio Hato, David and Galapagos the ice cream used is manufactured locally using identical machines and raw products as at the central exchange ice cream plants. These post exchanges deliver to the smaller stations in their areas by post exchange truck, military transportation or by plane. Bacteriological tests are frequently made.

Meat.--The enlisted men's messes in the Canal Zone and in the Republic of Panama within suitable transportation distance by truck transport or plane obtain beef, veal, pork, lamb, poultry and meat products on issue from the cold storage warehouse of the Quartermaster. The meat, poultry and meat products issued are obtained from two sources: The United States (beef, veal, pork, lamb, poultry and meat products, all United States government inspected); and the Government Rastro at Escuintla Guatemala (beef in quarters only, inspected anti-mortem and post-mortem by an officer of the Veterinary Corps.)

Meat and meat products for the officers' messes, post exchanges and concessionaires in the Canal Zone and nearby stations are obtained from the Panama Railroad Commissaries. These products are inspected by Veterinarians of the Health Department, the Panama Canal and are also frequently inspected by the Veterinary officers of the Department.

At outlying stations such as San Jose, Costa Rica, Guatemala City and San Jose, Guatemala, local purchases from approved and inspected sources are made. In Guatemala, the Veterinary officer on duty at the Rastro inspects all meat and meat products. At San Jose, Costa Rica, the office of the Coordinator of Inter-American Affairs, Sanitary Division, makes the inspections. The Anti-Biological Warfare officer inspects approximately once each three months.

Fresh Vegetables.--The sources of fresh vegetables were the United States and some approved local sources. The approved local sources were, first, the Chinese gardens in the Canal Zone. These were supervised by either the Health Department of the Panama Canal, or by the U.S. Army. Secondly, sources developed by the Office of the Coordinator of Inter-American Affairs in Costa Rica, Panama, Guatemala, and Ecuador. These sources do not use human fecal material as fertilizer and are constantly inspected by the Quartermaster Purchasing Agent and agents of the Office of the Coordinator of Inter-American Affairs. The Anti-Biological Warfare officer has inspected the growing areas in Panama, Costa Rica and Guatemala. The Veterinary officer assigned to Salinas, Ecuador inspects the growing areas in Ecuador.

All vegetables to be consumed raw are separated leaf by leaf and soaked in a solution of Mikroclean, twenty parts per million available chlorine for thirty minutes. Tomatoes are blanched and the skin removed before being consumed raw.

Staple Food Products.--Staple canned goods, packaged goods and items such as flour, sugar, coffee, butter, etc., are issued to troops by the Quartermaster. The use of Argentine butter has been stopped. With few exceptions the products are all processed and packaged in the United States.

Local purchases of staple food products are made by officers' messes, post exchanges, concessionaires and the U.S.O. Clubs. All firms from which such purchases are made have been carefully inspected and security tested. Practically all of the products purchased are now of United States manufacture.

Bread.--At outlying stations and officers' clubs, at post exchanges, concessionaires, and U.S.O. Clubs, bread prepared by local bakers is used. All such bakeries have been security tested, a careful sanitary inspection has been made and check inspections are carried on by the Anti-Biological Warfare officer and the local surgeons. The bread has universally been of good quality and well prepared.

Candy.--With the exception of one company located in the City of Panama no inspection of candy manufacturers has been made. This firm, Molino and Clark, desired to sell to post exchanges and the Quartermaster. They have been security tested and their plant has an excellent sanitary rating. The bacteriological examination of the candy revealed entire absence of organisms of the typhoid, coliform, aerogenes, dysentery group.

c. Water Supplies.--All permanent posts, camps and stations located within the Canal Zone receive their water from the Canal Zone filtration plants. This water is of excellent finish and has a low bacterial count. The plants are located at Mount Hope and Miraflores. The water is coagulated, filtered and chlorinated. Breakpoint chlorination is not practiced at stations distant from the plant, therefore, the minimum of a four-tenths parts per million residual is not maintained. During the past year the installation of check valves and chlorine or hypochlorite injectors to additional chlorine as the water entered each station was recommended. This was not considered feasible by higher authority. At the temporary stations which receive Canal Zone water the chlorine residual is brought up to four-tenths parts per million wherever the installation is practicable and no danger of back flow into the mains exists.

At outlying bases, camps and stations local sources of water are used. These consist of wells, springs, lakes, and, as at San Jose, Costa Rica, and Guatemala City, Guatemala, the local city water supply, which is rechlorinated to a constant residual of one part per million. At all outlying bases, camps and stations a chlorine residual of one part per million is maintained.

Protection of Water Supplies.--All wells, reservoirs, reservoirs riding on the line, water tanks and pump houses are now provided with locks on all man holes, doors, and windows. The program of providing Biological Warfare proof pump houses is continuing. This program has a low priority.

During 1944, minnows were used at all stations as an indicator relative to the absence of toxic substances in the water supplies. It was found, however, that all minnows available locally were susceptible to chlorine. Wood shavings were placed in the line leading to the constant flow fish bowl in an effort to remove all chlorine but unless fresh shavings were placed in the U tube at least each twelve hours a chlorine residual of four-tenths parts per million resulted in the rapid death of all minnows. The use of minnows was discontinued 1 January 1945.

The chlorine residual of the water supply was recorded at all stations at two hour intervals from 0600 to 1800. Bacteriological tests of all water supplies were made twice monthly. During 1945, a chemical analysis was made of each water supply source. An Engineer investigation of the existence of cross connections was made, and these connections were eliminated.

A standard ordinance for the installation of plumbing fixtures, use of siphon breakers, traps, soil pipes, taps with outlets below the overflow vent, etc., has been adopted for use throughout the Department.

d. Foodhandlers.--All prospective foodhandlers are examined physically and laboratory examinations of the stool of each person are made to determine the freedom of the individual from clinical evidence of infection with, or the carrier state of amoebae, intestinal parasites, and organisms of the typhoid, salmonella, dysentery group.

e. Rats.--Campaigns for the elimination of rats have been carried on at all stations. As a result, a survey made during April and May 1945, showed an extremely low degree of rat infestation. Rats caught are sent to the laboratory for examination with special reference to plague (bubonic). No evidence of unexplainable deaths of rats or unexplainable decrease in rat populations has been observed. DDT is now being used in all buildings occupied by troops. The baseboards, and walls of such buildings are sprayed with a five percent solution of DDT once each month. The possibility of flea infestation is greatly reduced. When rat warrens are found DDT powder insecticide is used. Rats caught in this Department have been remarkably free from ecto parasites.

f. Insects.--The Medical Department Field Sanitary Force constantly collects all types of insects. These are examined to determine family and genus, and any capable of transmitting disease are sent to the Army Medical School, Washington, D.C. for class use and further identification. If any insects not usually prevalent in this area are found an immediate investigation would be started.

g. Diseases among Animals.--Excellent liaison is maintained between the Anti-Biological Warfare officer, the Health Department of the Panama Canal, the Director of Health of the Republic of Panama, the Veterinary services of the Panama Canal Department, The Panama Canal and the Republic of Panama and the Gorgas Memorial Institute. The occurrence of any new or unusual disease among animals becomes known to the Anti-Biological Warfare officer almost at once. An incidence of such disease is now being carefully studied by the Health Department, The Panama Canal, and a specialist has been assigned from the Department of Agriculture to continue the investigation.

h. Outbreaks of Food or Beverage Infection.--Since the 27th of May 1944, there have been five outbreaks of food poisoning among military personnel in this Department. A standard epidemiological questionnaire has been prepared and each outbreak of food infection is carefully investigated. A complete bacteriological survey and a complete sanitary survey are also made. In each outbreak infractions in cleanliness in the preparation and handling of foods have been found. No evidence of subversive activities was uncovered. There have been no cases of illness traceable to contamination of foods or beverages by subversive activities.

i. Rates of Disease.--The rates per thousand per annum for all diseases have remained low. There has been a slight rise in the admission rates for the common respiratory diseases since 1 January 1945, but the rate remains below seventy-five per thousand per annum. There has been no increase in the rates of insect borne diseases including malaria. The rate per thousand per annum for venereal disease which could be classed as a disease which could be spread by subversive persons has shown a slight but steady decrease.

j. Personal Security Investigation.--Investigations have been completed on two hundred thirty-six key personnel of sixty-nine business companies. Approximately one hundred additional investigations are in various stages of completion.

k. Japanese Free Balloons. There has been no indication that free balloons have drifted into the territorial area occupied by this Department. The Department has been alerted to this possibility and

the attention of all Intelligence, Medical Corps, Medical Administrative Corps and Sanitary Corps officers directed to the provisions of paragraphs 6, 7, and 8, Panama Canal Department Mimeograph Letter No. 20, File AG 720-1, 20 March 1944, subject: "Biological Warfare."

## Chapter 9 C

### THE SANITARY ENGINEERING DIVISION

a. General.<sup>49</sup>-Prior to the emergency the volume of preventive medicine work in the Department was comparatively small. Due to the fact that the Sanitary Corps was a Reserve Component only of the Army, commissioned sanitary engineers were not available to the Medical Department. The work normally performed by sanitary engineers was necessarily absorbed by Medical Corps officers.

When the Department began to expand rapidly as a result of the emergency, it was recognized that some sanitary engineering organization would be highly desirable. Several important situations existed in the Department, however, which substantially reduced the need for a full scale Sanitary Engineering Division. Two major Panama Canal water purification plants were already constructed and in operation from which all major posts and stations in the zone could be supplied. There were only three sewage treatment plants for Army installations and these were of relatively simple nature. Rodent control was not a particularly serious problem and garbage disposal systems were reasonably established. The real problem existing was the effective control of malaria which necessarily required the elimination of mosquito breeding areas. Extensive emergency construction work had created multitudinous new breeding areas.

Posts, bases, and stations in the Department were relatively small. It was recognized that in the interest of conservation of personnel, it would not be practicable to assign sanitary engineering personnel to posts, bases or stations, even the largest. It rather seemed more feasible to build the required organization around the Department Surgeon's office, which would require only one sanitary engineer officer whose principal duty would be to set up major engineering projects for the permanent elimination of mosquito breeding areas. This same officer also would be available for assignment to special investigations concerning water supplies, sewage treatment and disposal and other problems of sanitation. The routine supervision and execution of sanitary measures would have to depend upon unit Medical Corps officers who necessarily were required to provide adequate medical services.

In October 1942, a Sanitary Corps officer, with a sanitary engineering classification was requisitioned by the Department Surgeon's officer. Due to the critical need for officers with this classification in practically every area where Army troops were stationed, such an officer could not be immediately furnished. In May 1943, the officer arrived and was assigned to the Department Surgeon's Office as Assistant Department Malaria Control Officer.

b. The Ten Year Comprehensive Drainage Problem for Malaria Control.--The Medical Corps officer assigned to the position of Department Surgeon in May of 1943 quickly realized the necessity for and the magnitude of the problem to set up a permanent drainage program to include all of the major Army installations in the Zone. When the sanitary engineer officer arrived, he was put to work immediately developing this program. Field survey crews and draftsmen were made available to this officer by the Corps of Engineers.

Existing maps of posts and bases were examined for possible use in this program. These maps were found to be deficient in these respects that in the main they were not up-to-date to include war time construction and the areas mapped extended only to the developed edges of the posts and bases. For a time, it seemed that a major mapping project would be required. It was then suggested by the Department Surgeon that consideration be given to the use of aerial photographs in the work. Negatives of practically all areas were available at the sixth Air Force Headquarters which were enlarged to positive prints, scale 1:2500. At this scale, sufficient detail and working space were available so that the prints could be taken into the field and all drainage courses, swamps and areas of impounded water plotted thereon in red ink.

An overlay tracing of the aerial photograph was then made so that unlimited quantities of prints of the project could be made. A report to accompany these prints was written by the sanitary engineer stating the work it was thought necessary to accomplish and classifying it as to priority of accomplishment.

The first post to be mapped under the program was the Post of Corozal. It was recognized that areas surrounding Army installations and allocated to the Panama Canal would have to be considered as well as Army property. Accordingly, the Corozal Cemetery area located between Corozal and Ft. Clayton was next mapped. During the entire mapping program from June 1943 to July 1944, the following areas were mapped and programs for drainage set up:

<u>Area Number</u>		<u>Location</u>
1.	-	Post of Corozal
2.	-	Corozal Cemetery
3.	-	Albrook Field
4.	-	Ft. Clayton
5.	-	Area along Ft. Clayton--Albrook Highway
6.	-	Ft. Kobbe
7.	-	Quarry Heights
8.	-	Ft. Amador

<u>Area Number</u>		<u>Location</u>
9.	-	Camp Paraiso
10.	-	Area Northwest of Ft. Clayton
11.	-	Ft. Davis
12.	-	Ft. Randolph
13.	-	Ft. Gulick
14.	-	France Field
15.	-	Galeta Island Area
16.	-	Camp Coiner--Coco Solito Area
17.	-	Tank Area Between Ft. Davis and Ft. Gulick
18.	-	Ft. Sherman
19.	-	Area South Ft. Sherman
20.	-	Outlying Area North Ft. Davis
21.	-	Rio Hato, R de P

As quickly as an area was mapped and the reports containing recommendations written, the reports were transmitted to G-4 with a request for funds for construction of the proposed improvements. For the Fiscal Year 1945, approximately \$250,000 was made available for actual construction. With this fund, substantial work was done by the Corps of Engineers Construction Forces at Corozal, Albrook Field and Ft. Kobbe and at France Field by a private contractor.

For the Fiscal Year 1946, approximately \$400,000 was allocated for the program. Work called for in this project was located at Corozal, Ft. Kobbe, Albrook Field, Area along Ft. Clayton--Albrook highway, Ft. Davis, France Field and Ft. Gulick.

In October 1945, the Office of the Department Surgeon submitted a recommendation for continuation of the program. The areas in which construction would be performed were Ft. Gulick, Ft. Sherman, Area along Albrook--Clayton Highway, France Field, Ft. Kobbe, Ft. Clayton and Corozal Cemetery, at a cost estimated to be \$400,000.

It is anticipated that continuation of this program will be provided for over a period of several years. If this is done, a point should be reached where practically no oiling would be required on any of the permanent posts or bases.

c. The Medical Department Field Sanitary Forces.--This section of the Office of the Department Surgeon was a civilian organization operating under the direct supervision of the Medical Corps Officer holding the position of Assistant Department Malaria Control Officer. This organization consisted of three key gold civilian employees and several hundred silver employees. The work of the Medical

Department Field Sanitary Forces covered many activities. Most important of these were the collection and identification of mosquito larva and adults; the oiling and spraying of impounded and casual water; the maintenance and cleaning of ditches; the manufacture of precast sectional invert concrete drains; and the lining of earth ditches with precast sectional invert concrete drains.

Teams from the Medical Department Field Sanitary Forces continually searched for larvae in streams and impounded water areas; others searched barracks and other Army buildings for mosquitoes lurking in dark corners and cracks.

Other teams equipped with knapsack sprayers sought out all areas of impounded water particularly those reported by the larvae-hunting teams to contain larvae. During the early part of 1945, the use of DDT was begun. As a matter of training the oilers who were long accustomed to using large amounts of oil to apply reduced amounts of DDT solution in the initial change-over only 1% DDT solution was used. By September 1945, the concentration of the solution was increased to 5%. Whether it will be practicable in this Department to apply this concentrated solution in the minimal quantity of 1 quart per acre recommended remains to be seen.

At periodic intervals the ditch maintenance gangs cleaned and reconditioned all earth ditches on posts and bases not assigned to organizations for maintenance. These gangs also were available for cleaning out ditches and drains blocked by some special condition.

The Medical Department Field Sanitary Forces had for many years previous to the emergency operated tile plants on both the Pacific and Atlantic sides. In periods when weather conditions were such that outdoor work was not practicable, personnel were utilized in the manufacture of precast sectional invert concrete and sub-surface drains. In 1944 these tile plants were shut down making the Medical Department dependent upon purchases from the Corps of Engineers for concrete drains.

During the entire emergency, the Sanitary Forces carried on an intensive program of lining earth ditches with precast sectional invert concrete drains. This work, necessarily, in the main, was confined to permanent Army installations. However, some semi-permanent areas were improved by concrete ditch drainage systems. During the Fiscal Year 1945, this program reached its peak when between 70,000 and 80,000 linear feet of precast drains were installed. During this same year, for the first time, the forces lined several thousand linear feet of ditch side walls with precast concrete slabs. This construction represented a marked improvement in sanitary drainage since "pot-holes" often existing in ditch sides at the tops of sectional drains were permanently eliminated.

d. The Boards of Officers Appointed to Study Certain Aspects of Malaria Control.--During the latter part of the year in 1944, the desirability of initiating an extensive airplane DDT spraying program in the Department for experimental and practical malaria control purposes was recognized. Three separate boards were appointed to supervise this work and the Sanitary Engineer Officer served on each of these Boards as recorder on the first two and as chairman of the ground crew committee on the last Board. In these assignments, the Sanitary Engineer prepared necessary maps, drawings, charts, etc., made layouts of the areas to be sprayed, erected signal markers to guide the airplane pilot while spraying and located and maintained the horse traps used for mosquito catching.

e. Water Supply.--Sanitary surveys in connection with new water supplies and changes in existing supplies were made by the Sanitary Engineer or a Medical officer in the Office of the Department Surgeon when surveys were indicated. These surveys required considerable travel and some of them were made in very remote locations accessible only by Indian Cayuca or "Cub" type aeroplanes. During the years 1944 and 1945, routine sanitary surveys were made of all water supply installations under direction of the Office of the Surgeon General. Since installations under Department jurisdiction were scattered over the Canal Zone, Republic of Panama, Central and South America, it was not practicable to assign one officer to make all the surveys. Each organizational surgeon was charged with the responsibility of making these surveys with assistance from the Post Engineers and under the general direction of the Department Medical Inspector. Toward the end of this program, the Sanitary Engineer officer became available from other duties to assist in these surveys. While some difficulties were experienced by the various organizational surgeons in reporting on the engineering phase of the surveys, the fact that during the years 1943, 1944, and thru September 1945 not a single case of water borne disease occurred in the Department indicative that the various organizational surgeons were very thorough in their knowledge of the more practicable and fundamental principles of Water supply.

Routine orthotolidine tests for residual chlorine were made every two hours by organizational surgeons to insure the fact that at least 1.0 ppm. free chlorine was present in all water not obtained directly from Panama Canal Purification Plants. During 1945 a directive was issued to require all installations using surface water not treated by sedimentation and filtration processes to maintain a chlorine residual at the end of 30 minutes contact period of at least 2.0 ppm. This increased dosage was ordered to destroy possible amebic cysts sometimes present in surface waters.

Bacteriological analyses were made as a matter of routine every two weeks at each installation. When an occasional sample was found to be positive for colon-aerogenes organism, an immediate investigation was

instigated. In practically every case, a subsequent sample would be found negative, and the sanitary survey did not reveal specific defects, indicating that the positive samples were probably attributable to faulty technique in collection.

f. Sewage Disposal.--On 14 November 1940, the Department Medical Inspector, later appointed Department Surgeon was appointed to a Board to determine a long range program for sewage disposal to include all U. S. Government agencies in the Zone. In 1941 and 1942, this Board submitted comprehensive reports making certain recommendations for sewage disposal on each side of the Isthmus. Due to the emergency existing at that time no extensive construction work could be justified for the purpose of sewage disposal.

Any extensive work by the Army involving sewage disposal was therefore practically brought to a standstill except that which was of extreme urgent nature or fitted into the long range program developed by the Board. Three sewage treatment plants however were constructed by the Army at (1) Ft. Kobbe, (2) Ft. Gulick, and (3) Camp Chorrera. Numerous septic tanks were built at comparatively small stations throughout the Department. Sewage from other main posts and bases were disposed of by dilution in natural or artificial bodies of water including the Canal, lakes, bays and seas. Pit latrines were used for small isolated stations.

g. Bathing Beaches and Swimming Pools.--Routine bacteriological analyses of water in swimming pools and at bathing beaches were made. If samples positive for colon-aerogenes were found in swimming pool water, the pool was drained and refilled. If water from existing beaches was found to contain colon-aerogenes organisms, the beach was placed on an "off-limits" status until a thorough sanitary survey proved that it was again safe for bathing purposes. Proposed beach sites were investigated for possible sources of contamination and if none were found sufficient bacteriological samples were analyzed to evaluate the water and properly classify it.

Chapter 9 D

SCHISTOSOMIASIS

Schistosoma mansoni infestations are endemic in Puerto Rico. Single stool examinations of Puerto Rican inductees revealed an infestation rate of approximately 10 per cent. Inductees who were found positive at this single examination were rejected.

There was no medical or parasitological evidence that schistosomal infections existed in the territorial areas composing the Panama Canal Department. No cases of Schistosomiasis in which infection could be traced to the Canal Zone or the Republic of Panama are recorded at Gorgas Hospital.

The 65th Infantry, Puerto Rican, was stationed at Empire, Canal Zone during and following World War I. These troops were not screened to eliminate those infected with Schistosoma Mansoni. These men bathed in the natural fresh waters in the Canal Zone and the Republic of Panama but there is no evidence that there was any infestation of intermediate-host-molluscs.

The arrival of Insular organizations in this Department starting in 1943 again raised the question of the possibility of the introduction of Schistosomiasis in this area. In August 1944 a survey was conducted using a reportedly highly specific skin-test-cercarial antigen which was carefully checked by the examination of 5 consecutive, daily stools.

The results of the stool examinations revealed an infestation rate of approximately 40 per cent.

Snails were collected throughout the Panama Canal Department. No snails of the species *Australorbis Glabratus* were found. Snails of all species collected were sent to the School of Tropical Medicine, San Juan, Puerto Rico where laboratory tests to determine whether or not any of the species of snails could be infested with the miricidia of *S. mansoni* and become intermediate hosts. The results of these experiments were all negative.

Unless molluscan hosts are introduced into this area there is no danger of the introduction of Schistosomiasis through the medium of infested Insular Troops.

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THE PREVENTION OF DISEASE IN THE UNITED STATES ARMY DURING  
WORLD WAR II

THE PANAMA CANAL DEPARTMENT

1 JANUARY 1940 TO 1 OCTOBER 1945

VOLUME II

THE PROTECTION OF TROOPS AGAINST SPECIFIC DISEASES

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## CHAPTER 10

### Immunization

The provisions of the Army Regulations and the Technical Bulletins Medical relative to immunization were strictly carried out in this Department. In addition to the initial series of typhoid, the required stimulating dose of 0.5 cc. was given to all personnel at yearly intervals.

Small-pox vaccination was accomplished at least every three years. The initial course of tetanus toxoid was administered to all troops in this Department at the time of publication of the respective Army Regulations and stimulating dose was given six months thereafter. In all cases of puncture or lacerated wounds, a stimulating dose of tetanus toxoid was given at the time of treatment at the dispensary.

Yellow fever vaccine was first administered in this Department in October 1941. All troops were immunized. Approximately 500 cases of infectious jaundice developed among the immunized personnel. Stimulating doses of yellow fever vaccine were given in 1945 to all personnel this Department who had not been so immunized in four years.

All military personnel traveling to or through the mountainous portions of Central and South America were immunized against typhus. Since there is no regular season for the development of typhus in these areas, stimulating doses of typhus vaccine were given every six months.

All personnel this Department under orders to proceed to the European, Mediterranean, the Pacific or China-Burma-India theaters were immunized against cholera and plague.

Anti-rabies treatments were kept on hand at all times. Despite the absence of rabies in dogs in the Canal Zone per se, anti-rabies treatments were given all military personnel who had been bitten by a dog which could not be examined if killed, or placed in quarantine for 15 days if alive.



## CHAPTER 11

### Intestinal Infections

The low incidence for intestinal infections attained in the Panama Canal Department during the World War II period resulted from the indoctrination of troops in the methods of prevention of these diseases and the maintenance of high standards of environmental sanitation. The following preventive medicine program was in effect in this Department during the World War II period 1 January 1940 to 1 October 1945:

Protection of Water Supplies. The residual chlorine content of water supplies except the municipal water supplies of the Panama Canal and of the International Petroleum Company at Talara, Peru was maintained as follows from 1 January 1940 to 1 October 1945: permanent posts, camps and stations, 0.4 ppm; temporary installations and field positions, 1.0 ppm.

The residual chlorine content of the water supplies of all military installations were checked every two hours from 0600 to 1800 and graphic records checked.

Samples of water from all military water supplies were submitted for bacteriological examination every two weeks. Immediate surveys were made of water supplies shown to be positive for organisms of the Coli aerogenes group and follow up specimens were submitted.

Small fish tanks containing minnows were maintained on the water supply line at each station. The water was dechlorinated by passage through pure wood shavings prior to entering the fish tank. The presence of any toxic substance in the water supply would result in the death of the minnows and immediately give the alarm.

All wells were cased and sealed in at the first impervious stratum. Well heads were protected by impervious concrete slabs. All well-houses, spring-houses and pump-houses were kept locked when not actually being attended. All windows were fitted with metal covered blinds which were kept locked. All man holes to reservoirs and reservoirs riding-in-line were fitted with locks and kept locked. Guards were maintained.

Food Supplies. All food supplies were obtained from the Quartermaster Subsistence Depot, The Panama Canal Commissary Division or from authorized sources which had been inspected and security-tested.

Frequent sanitary inspections of all establishments, military or non-military, furnishing items of food or beverage to the Army were made by the Department Medical Inspector and the Department Veterinarian.

Locally grown fruits and vegetables unless obtained from authorized and inspected truck gardens in the Canal Zone or from authorized and inspected agencies of the office of the Coordinator of Inter-American Affairs were peeled, boiled or treated with chlorine solution 50 parts per million for 30 minutes before consumption.

The sale of prepared food stuffs, including candy, ice-cream, sherberts, etc., and sandwiches, pies, pastries or other prepared or raw foods on military reservations except at post exchanges, officers and N.C.O. Clubs, and post restaurants was forbidden.

Special regulations relative to the preparation of easily contaminated foods were enforced. The preparation of these foods, which included potato-salads, meat-salads, cream-pies, cream-puddings, etc., were so timed that the time of serving coincided with the time of completion of cooking. The use of sandwiches for field lunches was restricted to non-protein foods unless adequate amounts of ground pickle mixture containing vinegar was used as a filler in addition to the protein food. The use of left-overs was restricted. No left-overs containing cream sauces or mayonnaise, cream-desserts, or salads were permitted to be used. All left-overs used were thoroughly re-cooked prior to serving.

Transportation of food. Rations were transported in clean trucks. Bread was transported in specially prepared bread boxes or in clean mattress covers. Meat was transported in the frozed state in the original card-board container in the case of boneless cuts, or in clean shrouds in the case of quarter beef.

With the receipt in this Department of mechanically operated refrigerator trucks in the fall of 1942, all perishable rations were delivered to the outlying posts, camps and air bases in these trucks. Water transportation provided with cold storage was used in the transportation of ration supplies to bases in Guatemala, Ecuador, and Peru.

Storage of food. Prior to the completion of the quartermaster cold storage and ice plant at the Post of Corozal in 1943, all bulk perishable stores were stored at the Panama Canal Cold Storage Plant at Mount Hope. Delivery was by refrigerator cars from the plant.

All messes, even the small aircraft warning, search light and automatic weapon positions, were provided with refrigeration. With exception of the camps at Chorrera and Pacora, these were mechanical Kerosene operated refrigerators since electricity was not available.

Battalion messes, consolidated messes, and post and air base messes were provided with both sharp-freeze and chill walk-in boxes. The sharp-freeze boxes were operated at 20 degrees F.; in the chill boxes at 40 degrees F.; walk-in boxes operating at from 35 to 40 degrees were installed in company and battery messes. Unit and small detachment messes used mechanical boxes of from 15 to 60 cubic feet capacity. Perishable items were not permitted to be held for more than 48 hours in chill boxes.

Consumption of Food Away From Military Reservations. All restaurants, refreshment stands, hotels, beer gardens, cantinas, and cabarets known to be patronized by military personnel, or to cater to military personnel, were regularly inspected by the Department Medical Inspector. Security testing was obtained whenever required. The sanitation of these establishments, the source of the food-stuffs and beverages served, and the health examinations of the permanent food-handlers was regularly checked. The methods of processing cooking and eating utensils were required to conform to military standards. Refrigeration was required to be maintained at not higher than 40 degrees F. Establishments not conforming to the sanitary requirements were placed "Off Limits" to all military personnel.

Processing of Cooking and Eating Utensils. The provisions of paragraph 15, and changes 1, AR 40-205, were rigorously enforced at all messes, post-exchanges, officers clubs, N.C.O. clubs, beer gardens, and U.S.O. clubs.

Flies. Flies were not tolerated about mess and other establishments serving food. Fly traps were maintained about garbage racks at permanent stations and in the field. Fly paper and poisoned bait were also used. Mess halls, store rooms and kitchens were screened and doors kept closed when not in use. Mess halls, store rooms and kitchens were regularly hand-sprayed or power-sprayed with a solution of one part concentrated extract of pyrethrum (20 times concentrated to 15 parts kerosene).

Cock Roaches. Prior to the availability of DDT, cock roaches were kept at a minimum by scrupulous cleanliness, the use of sodium flouride and the use of pyrethrum in kerosene.

Rats and Mice. All buildings in which food was prepared or stored were rendered rat proof. The construction of rat curtains, the building of mess halls and kitchens 8 feet above the ground on concrete columns with a concrete slab under the building at ground level, the construction of garbage racks 24 inches off the ground, and the elimination of breeding areas by use of proper dunnage in the storage of supplies, kept rat infestation to a minimum.

Food-Handlers. In addition to the physical examinations required under the provisions of paragraph 13, AR 40-205, stool examinations and blood serological tests were performed in the cases of all prospective permanent food-handlers, both military and civilian.

As a result of the stool examinations, 3 typhoid carriers and 61 carriers of organisms of the *Salmonella* group were identified during the World War II period, and prohibited from being employed as food-handlers.

Individuals with repeated positive serology were not barred from employment as food-handlers if free from infectious lesions of syphilis, but were required to take treatment if not already doing so.

## CHAPTER 12

### Infections of The Respiratory Tract and Infections Transmitted by Discharge From The Respiratory Tract

The epidemiological theory that infections, contagious diseases and certain insect-borne diseases are disseminated throughout the world over the routes of travel and at the speed of travel has been amply proven in the Canal Zone and the Panama Canal Department.

The Canal Zone has been justly called the "Cross Roads of the World" for the ships of all nations transit this water-highway, and have for the past 32 years, and more recently the airways have rivaled the waterways as a method of commercial travel and shipment of cargo.

The human cargo discharged from the ships of the sea and the ships of the air have brought with them the infectious agents of their communicable diseases, their ectoparasites and their endoparasites despite adequate and excellently enforced quarantine measures. The healthy carrier, the case in the incubatory stage, and the missed case from areas where there is no epidemic prevalence of the disease and a negligible endemicity slip through the screen of quarantine measures and enter this area.

Man is a gregarious animal, possessed of many bad habits. One of the most insidious of these habits is his constant contamination of his hands, his person, and his implements of toil and play and the air that he breaths with secretions of the respiratory tract. This may be tritely described in a homely way as the "International Trade in Spit." The Canal Zone is one of the world-markets in this trade.

The environmental conditions, even at best, in military life result in the increase of physical contact between the personnel of various units. This contact resulting from the communal existence is greatly increased during periods of emergency and war when, due to stark necessity, the standards considered minimal during peace time are drastically reduced.

The record achieved in the Panama Canal Department in the prevention of respiratory diseases was excellent. The rates per thousand per annum of the common respiratory diseases, the Panama Canal Department, for the World War II period 1 January 1940 to 1 October 1945, are set forth in Table I.

TABLE 1.--Rates per thousand per Annum, Common Respiratory Diseases, the Panama Canal Department, by Calendar Year for 1940, 1941, 1942, 1943, 1944, and for 1945 from 1 January to 1 October.

Year	1940	1941	1942	1943	1944	1945
Common Respiratory Diseases	187.1°	159.6	117.7	77.5	81.5	128.4

With the exception of three short, but sharp outbreaks of influenza like-fever in 1940, 1941 and 1945, only one of which, that in 1945, was serologically identified, and excepting the ubiquitous common cold, there were no outbreaks of importance of any other disease of the respiratory tract or of diseases tributary to infectious discharges from the respiratory tract. The rates per thousand per annum for certain infections of the respiratory tract and infections transmitted by discharges from the respiratory tract, for the World War period, are shown in Table 2.

TABLE 2.--Rates per thousand per Annum, for Certain Infections of the Respiratory Tract and Infections Transmitted by Discharges from the Respiratory Tract, the Panama Canal Department, for the Calendar Years 1940, 1941, 1942, 1943, 1944, and from 1 January to 1 October 1945.

Disease	1940	1941	1942	1943	1944	1945
Pneumonia, Primary	3.8	3.0	4.9	3.5	1.7	1.2
Pneumonia, Atypical	0.0	0.0	0.5	0.06	5.5	8.4
Influenza	2.7	1.5	0.5	2.9	0.4	105.2
Meningococcus Meningitis	0.0	0.03	0.02	0.06	0.1	0.03
Measles	0.5	2.5	1.4	1.2	1.1	0.4
German Measles	0.6	1.4	0.3	0.6	5.5	1.5
Diphtheria	0.0	0.1	0.07	0.02	0.07	0.2
Whooping Cough	0.0	0.0	0.0	0.0	0.0	0.0
Scarlet Fever	0.0	0.0	0.0	0.0	0.0	0.0
Mumps	0.4	0.3	0.3	0.6	1.3	0.2
Vincent's Angina	1.0	0.08	0.9	0.2	0.6	1.0

The following preventive measures were constantly enforced in the Panama Canal Department:

Ventilation. The open construction of all barracks and huts resulted in the maintenance of adequate ventilation at all times.

Head to Foot Sleeping. Whenever the distance between cots or beds was less than 5 linear feet, head to foot sleeping was enforced.

During periods of increased prevalence of diseases of the respiratory tract, head to foot sleeping was enforced regardless of the distance between beds.

Whenever considered necessary by the surgeon of an organization, sheets were used to screen one side of the bed or cot.

Personal Hygiene. Regulations relative to hand-washing before each meal, and after visiting the latrine were strictly enforced. Every effort was made to prevent spitting about barracks, recreation-rooms, mess-halls, kitchens, and places of common assembly. An effort was made to reduce the "trade in spit" by educating the personnel of the Department in danger of the use of common or communal articles, such as the common drinking cup, common towels, the trade in used cigarettes, personal articles such as handkerchiefs, pipes, etc.

At times of increased or epidemic prevalence of respiratory infections, every effort was made to prevent the common use of athletic equipment. The necessity of the daily bath, clean clothing daily exercise, a normal period of sleep whenever possible, and mouth hygiene were constantly stressed.

The provisions of paragraph 15, AR 40-205, were strictly enforced throughout the Department. Disposable individual wooden spoons, wooden forks, paper cups, and paper plates were standard equipment at all post-exchanges, and clubs.

Automatic drinking fountains were standard equipment in all barracks and in many offices.

Whenever automatic fountains were not available, a certificate was given by the surgeon that the issue of disposable paper cups by the Quartermaster was necessary to protect the health of the command. The policy of the Quartermaster general to prohibit the general use of paper cups at all times where drinking fountains are not available is considered short-sighted and at variance with standard public health procedures.

Prevention of Body Chilling. All individuals were instructed in the methods and measures necessary to prevent body chilling, especially after long periods of physical exertion. The axiom that it was better to be dry and out of the wind, though nude, than to be fully clothed in wet clothing and subject to further chilling through exposure to the wind was taught as a basic principle.

Working Quarantine. Whenever there was an outbreak of an infectious or contagious disease, a medical and epidemiological disease survey was conducted at once. Known or suspicious cases of the disease were hospitalized and placed in isolation. Close contacts were placed in working quarantine and physically inspected daily. This method was used whenever primary cases of these diseases developed and was also used in secondary cases except mumps.

The arrival of transports with histories of infectious or contagious diseases during the voyage or with active cases aboard was handled as follows: No troops were debarked until a medical and epidemiological survey was completed. If the disease had appeared generally throughout the ship, the entire complement of troops was placed in working quarantine for the required period from the development of the last proven case. Physical inspections were conducted daily, and all new cases or suspects immediately hospitalized.

Chemotherapy. Whenever a case of epidemic-cerebro-spinal-meningitis developed in an organization, the unit was placed in working quarantine following the medical and epidemiological survey and all individuals were given 2 grams of sulfathiazole. This was repeated the third day.

The above methods were most satisfactory. In the face of the 1943-1944 epidemic of measles in the United States, the receipt of cases on transports, and epidemic rates among the civilian population, the rates per thousand per annum for this Department for measles and German measles remained low.

Food-Handlers. A careful check was constantly maintained on the health of permanent food-handlers. All food-handlers with clinical symptoms of respiratory infections were relieved from this duty until free of symptoms.

## CHAPTER 13

### Venereal Disease

Venereal Disease infections among the troops of the Panama Canal Department have been a grave problem since the institution of the Department.

The economic and sociological conditions prevalent in the territories adjoining the Panama Canal Department makes prostitution a lucrative business. Although the practice of prostitution is illegal in the Republic of Panama, Costa Rica, Guatemala, Nicaragua, Colombia and Peru, this age-old profession is "tolerated" under the policy of "toleration." Prostitution is permitted in circumscribed districts designated by the government. These are known as tolerated districts or "barrios colorados." The women in these districts are registered as professional prostitutes, and are under government supervision.

Since prostitution is "tolerated," there are always other houses of prostitution, "call-houses" and houses of assignation in the large cities of these countries. In addition, there are the numberless legions of clandestine, in hotels, in parks, and also in every place where it is possible to contact the ever-desirous male.

Prostitution per se is not considered socially abhorrent and organized prostitution is looked upon as a legitimate business enterprise.

The American soldier in this area faces numerous problems. He serves in a tropical area with manners and customs strange and foreign to him. In time of peace, he learned that the residents of the Canal Zone looked upon him as a necessary nuisance and that the people of Panama saw in him only a source of income. In time of war he was a hero as long as there was danger of attack but was still looked upon as veritable gold mine by the natives of the Republic in which he was stationed.

These young soldiers desired the normal social relationship with young women of their age and nationality. In time of peace this was almost impossible because the average enlisted man was not considered eligible, and during the war period the number of young American women was entirely insufficient. The average soldier was frequently lonesome and homesick.

Many of the enlisted men assigned came in contact with open, commercialized vice for the first time in this area. Most of these young men were repulsed by their first encounters with the women of the streets; with the alternadoras at the cantinas; with the "blue-moon" girls at the cabarets; and with the jaded prostitutes of the "tolerated districts." However, as the length of service in this area increased, many found this repulsion wearing off and, following the example of their more experienced comrades, found solace in this companionship of women of doubtful character.

Liquor played a leading role in the problem. The cantinas and cabarets appealed to many as places of refuge from the humdrum military existence in an inactive defense command. Alcohol eased their troubles; but also released their inhibitions, weakened their powers of resistance, distorted their judgement, and prepared them for the advances of the ever-present loose women who knew only too well how to appeal to the Americanos' vanity and desire.

Prior to the start of World War II period, 1 January 1940, the Panama Canal Department consisted territorially of the installations in the Canal Zone and the Republic of Panama. With the development of additional bases there was territorial expansion of the Department. Troops occupied numerous positions throughout the Republic of Panama and also occupied bases and positions in Costa Rica, Nicaragua, Guatemala, Ecuador and Peru. Following the attack on Pearl Harbor, the strength of the detachments and garrisons at the outlying bases and positions was increased as reinforcements arrived in the Department.

The cities of Colon and Panama had been placed "Off Limits" during the greater part of the World War I period, 6 April 1917 to 31 December 1919. The venereal disease rate for the World War I period for the Panama Canal Department was 88.78 per thousand per annum. This rate, although slightly higher than the rate for the army as a whole for the World War I period was approximately 33 percent lower than the rate of 128.2 for the Department for the three years, 1914 to 1916 inclusive.

The rates per thousand per annum for "new" and "long" venereal disease for the Panama Canal Department for the ten-year period, 1936 to 1945 inclusive, are shown in Table 1.

TABLE 1.--Rates per thousand per Annum, New and Long  
Venereal Disease, Panama Canal Department  
for the years 1936 to 1945 inclusive.

Year	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945
Rate	54.3	50.1	50.1	45.0	66.1	64.8	60.8	42.7	20.3	17.1

Prior to February 1943, the Department Medical Inspector acted as venereal disease control officer without specific titular designation. The surgeon of each unit or organization or a Medical Corps Officer designated by him acted as organization or unit venereal disease control officer. The following is an outline of the venereal disease program which was carried out prior to 1 January 1941:

a. Campaign to promote chastity as the only certain method of avoidance of venereal disease.

b. The use of prophylaxes measures, i.e., chemical cleanliness whenever there was failure of moral cleanliness.

c. Education in the cause of venereal disease, the symptoms and sequelae of venereal disease, the methods of treatment of these diseases, and the methods of prevention.

d. Education in the methods of mechanical and chemical prophylaxis.

e. A program of athletics and recreation with participation of every enlisted man as a goal.

f. Indoctrinization of all officers in the fact that venereal disease control is a command responsibility and not solely a medical problem.

g. The establishment of prophylactic stations at each post, camp, station or position throughout the Department.

This program had been adopted in 1939. The rate per thousand per annum for "new" and "long" venereal disease for that year was reduced to 45.0, the lowest rate attained in the Department up to that time.

The program was intensified during 1940, but in spite of this, the rate per thousand per annum increased to 66.1. This increase was due to the large number of filler replacements received in the Department during the year, and the territorial dispersion of organizations throughout the Department. Field positions were permanently occupied and tactical training was intensified. At the same time, there was an increase in the number of cabarets and houses of ill-repute in the adjacent cities of Colon and Panama. The over-night pass remained in effect and many men sought relief from the ennui of camp life at small hill top positions in the night life of the terminal cities. There was a marked decrease in the prophylactic rate during 1940. This was the reaction to the provisions of W. D. Circular No. 14, 1 February 1940, which rescinded the regulations governing the punitive measures for failing to take prophylaxis and for developing venereal disease.

The government of Panama did not cooperate in either the suppression or repression of prostitution. Conferences between the Chief Health Officer, The Panama Canal, The Department Medical Inspector, The Panamanian Minister of Hygiene and Social Welfare and the Panamanian Director of Health were held and control measures advocated. These conferences were non-productive.

Prior to 7 December 1941, the garrison in this Department was augmented. Numerous new gun, search-light, aircraft warning and infantry positions were occupied. The territorial dispersal of the garrison was increased. Towns in the interior of Panama became foci of venereal disease. A program of poster publicity was instituted. The new venereal disease film was given wide publicity. Pamphlets were issued relative to prophylaxis, the classification, symptoms, methods of treatment and sequelae of the venereal diseases. The rate per thousand per annum for the first two months of the calendar year was over 80. Lower rates attained during the following 10 months resulted in an annual rate of 64.8 for the year, a slight reduction below the 1940 rate.

The attack on Pearl Harbor was followed by a marked fall in the venereal disease rate. The rate per thousand per annum for the first 5 months of 1942 was 39.6, a reduction of approximately one-third below the annual rate for 1941. When it was recognized that this area was not going to be an active theater, and the excitement of expectation waned there was an abrupt and striking rise in the venereal disease rate. Passes were limited from 1300 to 2300 and only 15 per cent of a unit was permitted to be on pass at one time. Despite these limitations, the rate of exposure increased. There was an influx of professional and clandestine prostitutes into the terminal cities, and into all towns adjacent to the larger areas and bases. In some instances, exposure was possible without obtaining

a pass, for the new camps and bases were not fenced and a state of blackout existed. This permitted dates to be made and contact to take place in unused areas of these installations. Additional cantinas and cabarets were opened in the terminal cities and new cantinas sprang up with fungus-like rapidity about outlying camps and bases.

The increase in the venereal disease rate, starting in June 1942, demanded forceful action. Troops were in training in widely dispersed areas. Periods in training lasted for from 14 to 21 days without interruption. Unfortunately, there was no organized and coordinated plans for recreation for the one or two day period of rest following the completion of each phase of the training program. With nothing better offered, men crowded the houses of prostitution, even fighting for places in line.

Unfortunately, too many commanding officers considered the venereal disease problem as a responsibility solely of the Medical Department. There was little command responsibility. A rumor had developed that men with venereal disease would not be sent overseas to an active theater, and G-2 intercepts showed that individuals were actually attempting to become infected in order to be hospitalized and removed from the possibility of overseas duty in an active theater.

Use of the "Report of a Contact of Venereal Disease" form, a U. S. Public Health Service form stocked by the Panama Canal Department, was instituted in September 1942.<sup>1</sup> The Chief Health Officer, The Panama Canal agreed to furnish the necessary personnel for the investigation of these reported contacts, and to hospitalize positive cases in the Prophylactic Hospital in the Republic of Panama, if the contact resided in the Republic, or at a Panama Canal Hospital if the contact resided in the Canal Zone. Difficulties were encountered in obtaining properly completed "Report of Contact of Venereal Disease" forms. Busy medical officers were prone to take haphazard histories.

In an effort to estimate the knowledge possessed by enlisted men relative to venereal diseases, questionnaires were prepared and answers obtained from the personnel of various units. Copies of these questionnaires are attached to this Chapter as Exhibit A. Based upon the answers to these questions, new methods of instruction were developed.

Conferences were held with each organization commander, and every effort was made to stimulate the personal interest of these officers in the methods of control being used. Monthly

conferences, attended by all surgeons and venereal disease control officers, were held. Round-robin discussions were stimulated, and new ideas and plans presented.

The annual rate for "new" and "long" venereal disease for the calendar year 1942 was 60.8, again a slight decline below the rate for the previous year.

During 1942, the surgeons of the major units of the Panama Canal Department were requested to prepare pamphlets for use in their organizations. The subject matter of these pamphlets included descriptions of the venereal diseases, primary symptoms of these diseases, the clinical course, sequelae, and methods of treatment. The value of chastity was stressed, and full directions for proper administration of prophylaxes were given.

The Department Medical Inspector was formally designated Department venereal disease control officer in February 1943. In March, venereal disease control officers were designated for all regimental, separate battalion, and similar unit commands, and for all posts, camps and air bases in accordance with the provisions of Section V, Circular No. 53, War Department, 1943. While these assignments were in addition to the officers other duties, the position of unit venereal disease control officer was now officially recognized where previously it had been a part of the general duties of one of the organization or post medical officers.

Special quarantine measures to be instituted in venereal disease infections were approved by the Department Commander and promulgated to the command in February 1943. This directive was again published in March 1943. These directives are appended as Exhibits B and C.

The experimental use of sulfathiazole in the prophylaxis was introduced in this Department in March 1943. Four, half-gram tablets (2 grams) of sulfathiazole were administered to all who volunteered to take this drug when chemical prophylaxis was taken and a second dose of 4, one-half gram tablets (2 grams) administered 12 hours after the first dose. Sulfathiazole was not used as a prophylaxis prior to exposure. A directive was issued outlining toxic reactions which might occur. Copy of this directive is appended as Exhibit D.

A poster campaign stressing prophylaxis against venereal disease was initiated. Individual posters were to be shown for two days, and then removed and replaced with another poster dealing with the same subject.

Individual prophylactic kits, authorized in accordance with War Department Letter, AG 710 (12-19-42) OB-S-SPMCE-M, were received in April 1943, and gratuitous issue started. These kits were well received by the men. The packets were not perfected however. The soap impregnated cloth or paper was not satisfactory. The gelatine capsule of mild mercurous ointment molded rapidly, and became stone-like in consistency. A high percentage of the mechanical prophylactics did not meet specifications. Samples of all lots of mechanical prophylactics were tested each month, and samples of those which did not meet specifications were sent to the St. Louis Medical Supply Depot for further test. Unsatisfactory lots of mechanical prophylactics were withdrawn from stock and disposed of as directed by the St. Louis Medical Supply Depot.

As an adjunct in the campaign for the use of prophylaxis, a "Return from Pass" form was developed. Each enlisted man returning from pass was required to complete the entries on this form. If the individual had been exposed the possibility of infection with venereal disease and had not taken a prophylactic, opportunity to take prophylaxis was offered and the necessity for this treatment stressed. A copy of the return from pass form is appended as Exhibit E.

In order to decentralize the publication of venereal disease control data and place the responsibility for proper education and indoctrination in the organizations, an outline of the venereal disease control memorandum was furnished all surgeons. The reaction to this was excellent. Copy of the outline is appended as Exhibit F.

As the control program developed and command responsibility was assumed, it became evident that the Medical Venereal Disease Control Officer of a unit or organization could not possibly carry out all necessary instruction. Specially qualified officers in all units and organizations were selected and designated as line venereal disease control officers. Selected non-commissioned officers were appointed as assistant venereal disease control officers. Courses of instruction were given these venereal disease control officers by the respective unit or organization surgeons and medical venereal disease control officers. This system was successful and brought personal instruction down to the squad.

Excellent directives for use of unit commissioned and non-commissioned venereal disease control officers were prepared in each of the major units.

The mimeographed booklet, "Venereal Disease", prepared by the Surgeon, Caribbean Defense Command, is an excellent example of these directives. A copy of this booklet is appended as Exhibit G.

The effects of the intensified venereal disease control program were first noted in June 1943 when the rate per thousand per annum dropped from 64 for the first five months of the calendar year to 43.7. The curve of the rate per thousand per annum by months from June 1943 to September 1945 shows a continuous decrease in the rate for "new" and "long" venereal disease. The most striking result was the decrease in infections caused by the bacillus of Ducrey. Table 2 sets forth the rate per thousand per annum for chancroid infections (*B. ducrey*) by months for the calendar year 1945, and the rates for gonorrhea for the same period.

TABLE 2.--Rates per Thousand per Annum for Chancroid and Gonorrhea, Panama Canal Department by Months, Calendar Year 1945.

Month	Chancroid	Gonorrhea
January	30.7	31.8
February	17.8	26.9
March	19.1	24.7
April	19.2	26.1
May	27.3	25.4
June	9.9	25.7
July	7.6	25.9
August	6.7	21.2
September	5.6	23.8
October	6.8	19.7
November	4.9	18.5
December	2.3	16.7

The rates per thousand per annum for chancroid and gonorrhea for the period 1 January 1940 to 1 October 1945 by calendar years are set forth in Table 3.

TABLE 3.--Rates per Thousand per Annum for Chancroid and Gonorrhea, Panama Canal Department, for period 1 January 1940 to 1 October 1945, by Calendar Years.

	1940	1941	1942	1943	1944	1945
Chancroid	25.3	25.9	24.5	12.6	0.9	0.3
Gonorrhea	30.4	33.7	31.5	24.3	15.9	12.4

The results of sulfathiazole prophylaxis introduced late in 1942 and extended as the data collected indicated that no severe reactions were encountered are seen in the above tables. This drug is specific in the prophylaxis of infections caused by the bacillus of Ducrey. The time factor after exposure during which the administration of sulfathiazole will result in prevention is longer than in the case of gonorrhea.

Sulfathiazole prophylaxis, i.e. 2 grams of sulfathiazole to be taken as soon after exposure as possible, was made available at each prophylactic station to all individuals reporting exposure and requesting sulfathiazole prophylaxis. The individual was examined for presence of venereal disease prior to administration of the drug and the tablets were swallowed in the presence of a medical officer or enlisted Medical Department technician. Sulfathiazole was not administered unless exposure was admitted.

An additional factor in the reduction of chancroidal infections was the treatment of women infected with gonorrhea and hospitalized at the Panamanian Prophylactic Hospital or in Panama Canal Hospitals with a long course of sulfa drugs.

It was also ascertained that professional and clandestine prostitutes having read of the value of the so-called-wonder-drug took 1.0 to 3.0 grams of sulfathiazole daily as a prophylactic. The drug being widely advertised and readily obtained at all drug stores.

There was a corresponding decrease in chancroid infections among male civilian employees during the latter part of 1943. Chancroid is now a relatively rare infection in the Panama Canal Department.

The intensive venereal disease campaign yielded increasing returns. The venereal disease rate for 1943 dropped to 42.7 per thousand per annum the rate for December being 22.7.

Based upon the attainment during 1943, the goal for 1944 was set at an annual rate of 25 per thousand per annum. The program for control was faced on the following factors:

- a. A drive for chastity.
- b. Universal prophylaxis when chastity was not maintained and exposure resulted.
- c. A continuous educational program reaching individual.
- d. The assumption of command responsibility by commanders of all grades.

e. The inculcation of the idea that venereal disease infection was preventable and unnecessary.

f. The development of high venereal disease control discipline.

The Department Commander was intensely interested in the campaign and was a stimulating influence for all subordinate commanders and venereal disease control officers.

The annual rate per thousand per annum for the calendar year 1944 was 20.3.

The continuation of all principles of the program produced rich results with the monthly rate per thousand per annum falling to 9.3 in August 1945. However, the maximum return did not continue. In September 1945, the Judge Advocate General ruled that the use of the "Return from Pass" form was illegal and that an individual was only required to report when he had reason to believe that he had a venereal disease. In spite of every effort on the part of the Department and Defense Command Surgeons, the ruling of the Judge Advocate General was upheld. The most important aid in the campaign for universal prophylaxis was lost at a time when the cessation of hostilities, redeployment and general lowering of morale took place. The monthly rate for September was 14.4, for October 19.8.

The Chief Health Officer, The Panama Canal, rendered invaluable assistance during the critical years of the venereal disease campaign. Dr. O. C. Wenger, U. S. Public Health Service was assigned to the office of the Chief Health Officer late in 1942. As special consultant, Dr. Wenger surveyed the situation in Panama, Colon and the interior towns and advocated stricter disciplinary measures for military personnel who became infected, and an intensification of the program for universal prophylaxis. As a result of these surveys, money was obtained for the construction of two centrally located prophylactic stations, one in the City of Panama and one in the Canal Zone adjacent to the main bus station. The station in the City of Panama was completed in 1943. Located adjacent to the Tivoli U.S.O. and the largest bus station on the Pacific side, it provided prophylactic facilities for personnel returning from the Rio Abajo area where eleven recognized houses of prostitution and a large number of clandestines operated. Hostile public opinion prevented the construction of the station at the bus stop in Ancon, Canal Zone, which was the main bus stop on the natural drift of personnel from the worst areas in the City of Panama.

Negotiations with the Republic of Panama resulted in permission to install army comfort (Prophylactic stations in the interior towns of Aguadulce, Chorrera, Rio Hato, and David.

The Department Medical Inspector personally carried on a campaign for the improvement of the methods of dishwashing and glass-washing in all restaurants and cabarets catering to, or serving military personnel. This campaign had the tacit approval of the Chief Health Officer of The Panama Canal who, through the Health Officers of the Cities of Colon and Panama, supervises the sanitation of these terminal cities. By the end of 1943, all restaurants, cabarets, cantinas and other establishments catering to or serving military personnel were properly equipped for the processing and sterilization of eating and drinking utensils. This campaign led indirectly to the installation of a suitable hot water supply in all recognized houses of prostitution.

A Director, Division of Venereal Disease Control, office of the Chief Health Officer, The Panama Canal, was appointed in 1943. Close cooperation with the Director of Health of the Republic of Panama was developed. Decrees requiring regular examination of all women engaged in prostitution and all alternadoras employed in cabarets were issued by the President of the Republic of Panama. Prophylactic clinics were established in the Cities of Colon, Panama, Rio Hato and David. These clinics were staffed by physicians employed by the Republic of Panama and paid in part by funds obtained by the Chief Health Officer.

The prophylactic hospital was enlarged in 1943, and again in 1944. All professional or clandestine prostitutes found on examination to be infected were hospitalized as soon as beds were available. In many instances women were held in jail until beds were available.

Despite the fact that there are failures in mechanical, chemical, and chemotherapeutic prophylaxis, it is firmly believed that the use of prophylactic measures is the only method by which individuals who expose themselves to the risk of venereal disease may obtain a high degree of protection.

In this Department, venereal disease prophylactic measures have been stressed as "first-aid measures" and have also been called "the first treatment in the cure of a possible venereal disease infection."

Professional and clandestine prostitutes in this area are almost universally infected. It has been stated that all prostitutes here fall into one of three classes relative to venereal disease: the first, those who are infected with venereal disease; the second, those who have been infected with venereal disease; and the third, those who are becoming infected with venereal disease.

The exposure rate, remained fairly constant in this area during the World War II period. High monthly prophylactic rates were always productive of low monthly rates for "new" and "long" venereal disease.

The slogan in this Department was, "Keep clean chemically if moral cleanliness fails." The goal was the use of mechanical prophylaxis during and chemical prophylaxis after every exposure.

The use of prophylactic slips was never discontinued in this Department. It was felt that although these slips were unofficial, their use permitted the gathering of statistical data relative to station prophylaxis as well as the use of mechanical prophylaxis and the individual prophylactic kit. Information relative to the description, and location of the female contact was also obtained. All men who took sulfathiazole prophylaxis were required to report to the unit surgeon on the 7th day after the administration of this drug for physical examination. Copy of the prophylactic slip used is attached as Exhibit H.

Sulfathiazole proved to be a most efficient prophylactic for gonorrhea and chancroidal infections. The failure rate was 0.3 per thousand in the case of chancroidal infections and 2.4 per thousand in the case of gonorrhea. Station chemical prophylaxis failed in 8.7 cases in each thousand of all chemical prophylactic treatments regardless of time after exposure. Prophylaxis was taken up to 12 hours after exposure.

Since all data relative to the time of exposure is the personal statement of the men taking prophylaxis, these statements are frequently colored in a desire to be credited with excellent venereal disease control cooperation. Frequently the time of prophylaxis and place of exposure given made it impossible for the individual to have been exposed at the time stated unless he had travelled to the prophylactic station in a heliooptic type airship.

The value of prophylaxis was proven frequently when several men who took prophylaxis reported contact with one female partner over a period of from one to two weeks, and to find this female partner reported as the "Source of Infection" by several other men as a result of contact during this same period but, without prophylaxis.

Failures of the individual prophylactic kit to protect against venereal disease occurred. The frequency, based on the number of men who became infected and who stated their only prophylactic precaution was the use of the individual chemical prophylactic kit as compared with the frequency of men who developed venereal disease and who took station chemical prophylaxis following exposure was approximately the same.

The use of mechanical prophylaxis alone failed in a high percentage of cases, not because of failure of the condom as a mechanical protection but because individuals consistently indulged in sex play prior to applying the condom.

The venereal disease program developed during the World War II period gathered momentum slowly. The curve from 1 January 1940 to 1 August 1945 was constantly downward. An effective prophylactic rate was attained and the value of prophylaxis proven. The reduction of chancroid infections was outstanding, and it is believed that this disease will no longer be a major public health problem in this area.



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VENEREAL DISEASE QUESTIONNAIRE

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The venereal disease problem is one of the most serious that faces the military forces and the health of our Country as a whole. If the present rate of infection with venereal disease in the Panama Canal Department continues, one out of each ten men will have become infected during each year of duty here, or in other words, if there were no change in the personnel of this command for a period of five years it is highly possible that one half of the command would have become infected during that period.

Because of the seriousness of this problem it is earnestly requested that you carefully study the attached questionnaire and to answer the questions personally without discussing them or your answers with anyone. Please be honest and sincere in recording your answers. DO NOT SIGN YOUR NAME. Upon completing the questionnaire please fold and seal questionnaire so that the blank side is out and place it in the box provided to receive these questionnaires outside of the Company office.

These questionnaires will be used by the Venereal Disease Control Officer in compiling information and statistical data in an effort to determine the most practical way in assisting the members of the military forces this Department in avoiding venereal disease.

You may be absolutely assured that the information given by you will be used only in an earnest effort to reduce venereal infection. It is again requested that you consider this questionnaire seriously and answer the questions fully, honestly, and sincerely. DO NOT SIGN YOUR NAME ANYWHERE ON THIS QUESTIONNAIRE.

VENEREAL DISEASE QUESTIONNAIRE

Please write plainly.

Please answer all questions.

Do not sign your name.

1. Age in Years:

2. Married? Yes \_\_\_\_\_ No \_\_\_\_\_.

3. If not married, have you had sexual intercourse? Yes \_\_\_\_\_  
No \_\_\_\_\_.

4. At what age did you first have sexual intercourse?

5. How often did you have sexual intercourse before entering the Army?

6. How often have you had sexual intercourse since entering the Army?

7. Do you drink alcoholic beverages? Yes \_\_\_\_\_ No \_\_\_\_\_.

8. If you drink alcoholic beverages, how much of the following do you drink each day, each week, or each month?

DAY

WEEK

MONTH

9. Beer? .....

10. Wine? .....

11. Hard Liquor? .....

12. Do you ever become intoxicated (drunk)? Yes \_\_\_\_\_ No \_\_\_\_\_.

13. If you become intoxicated (drunk), how often does this happen?

14. Do you consider wet dreams (nocturnal emissions) harmful? Yes \_\_\_\_\_  
No \_\_\_\_\_.

15. What is your total monthly pay?

16. How much money do you allot each month?

17. How much money do you put in bonds each month?

18. Do you know the anatomy (construction) of the male sex organs?
19. The female sex organs?
20. How many lectures on venereal disease given by Medical Officers have you heard this year?
21. How many since you entered the Service?
22. Have these lectures been instructive? Yes \_\_\_\_\_ No \_\_\_\_\_.
23. Have you learned what the venereal diseases are? Yes \_\_\_\_\_ No \_\_\_\_\_.
24. Do you know how the venereal diseases are transmitted? Yes \_\_\_\_\_ No \_\_\_\_\_.
25. Do you consider an infection with venereal disease serious? Yes \_\_\_\_\_ No \_\_\_\_\_.
26. Can venereal diseases effect your health later in life?
27. How many venereal diseases are there?
28. Please name three venereal diseases.
29. How can venereal diseases be prevented?
30. Why should a man who has connection with a woman put on a condom before touching the woman's genitals (sex parts) in any manner?
31. Why is a chemical prophylaxis necessary even if a condom is used?
32. Why should you wash your hands and sex organs with soap and water immediately following intercourse?
33. If you have sexual intercourse do you take a prophylactic? Yes \_\_\_\_\_ No \_\_\_\_\_.
34. If you take a prophylactic do you take it immediately following exposure or do you wait until a later time?
35. Do you drink alcoholic liquors before going with a woman? Yes \_\_\_\_\_ No \_\_\_\_\_.
36. If you have sexual relations with women other than your wife, do you
  - (a) Visit a woman in the legal district? Yes \_\_\_\_\_ No \_\_\_\_\_.

(b) Pick up a girl on the street? Yes \_\_\_\_ No \_\_\_\_.

(c) Visit houses outside of the legal district?  
Yes \_\_\_\_ No \_\_\_\_.

(d) Have a regular girl friend or companion? Yes \_\_\_\_  
No \_\_\_\_.

(e) "Shack Up?" Yes \_\_\_\_ No \_\_\_\_.

37. Do you believe the women in the legal districts are clean?  
Yes \_\_\_\_ No \_\_\_\_.

38. What percentage of the legal districts do you think have venereal disease?

39. Do you think "pick-ups" are clean? Yes \_\_\_\_ No \_\_\_\_.

40. What percentage of "pick-ups" do you think have venereal disease?

41. Is there any way for you to tell whether or not a woman has a venereal disease? Yes \_\_\_\_ No \_\_\_\_.

42. If you should become infected with a venereal disease what would you do?

43. Have you ever had (a) Gonorrhea,  
(b) Chancroid or soft chancre,  
(c) Buboes (blue balls),  
(d) Syphilis?

44. If you had a venereal disease was it during civil life or while you were in the Army?

45. Do you think it necessary for a man to have intercourse in order to keep healthy? Yes \_\_\_\_ No \_\_\_\_.

46. If you visit the prophylactic station, do you receive satisfactory treatment there? Yes \_\_\_\_ No \_\_\_\_.

47. Have you any hobbies?

48. Please name your hobbies:

49. How do you spend your time off duty?

50. Would you like more instruction in sex hygiene and how to prevent venereal disease?

51. How do you think the venereal disease rate could be reduced in this Department?

Please fold with blank side out and leave in the box outside of the Company office. DO NOT PUT YOUR NAME ANYWHERE ON THIS PAPER.

PASTE BOTTOM FOLD TO MIDDLE FOLD.

THUS COVERING ALL ANSWERS.



HEADQUARTERS PANAMA CANAL DEPARTMENT  
Office of The Department Commander

In reply  
refer to:  
AG 726.1-1

Quarry Heights, Canal Zone,  
12 February 1943.

Subject: Quarantine measures to be instituted in venereal disease infections.

To: CGs, CAC, MF, SC, (Including separate regiments, battalions, separate companies, and similar units); COs, all "other units" of the Field Forces; COs, all units of the Service Command; COs, all posts, camps, and stations.

1. For the purpose of protecting the public health, all military personnel who are admitted to the hospital or dispensary for venereal disease and in whom the diagnosis is confirmed by the approved clinical and laboratory methods will, upon discharge from the hospital or dispensary, be placed in working quarantine for a period of ninety (90) days from date of admission to hospital or dispensary.

2. All military personnel placed in working quarantine because of proved venereal infection will be restricted to the limits of the post, camp or station to which they are assigned and will not leave the limits of the post, camp or station except under proper orders and in the performance of military duty. However, such personnel may visit post theaters, Post Exchanges, and other places of common assembly on the post.

3. Upon returning the individual to duty, the medical officer concerned will indicate on the company sick book the fact that the patient is subject to the ninety (90) day quarantine, thereby placing the organization commander on notice as to the individual's status.

By Command of Lieutenant General BRETT:

s/G. S. ARMES  
t/G. S. ARMES,  
Colonel, Adjutant General's Department,  
Adjutant General.



HEADQUARTERS PANAMA CANAL DEPARTMENT  
Office of The Department Commander

726. (Surg)

Quarry Heights, C. Z.  
1 April 1943.

SUBJECT: Quarantine measures to be instituted in venereal disease infections.

TO: CG, A Comd;  
CO's all Air Bases, XAD's;  
CO's all units of the A Comd.

Letter, this headquarters, 12 February 1943, subject same as above, file AG 726.1-1, is quoted for compliance:

"1. For the purpose of protecting the public health, all military personnel who are admitted to the hospital or dispensary for venereal disease and in whom the diagnosis is confirmed by the approved clinical and laboratory method will, upon discharge from the hospital or dispensary, be placed in working quarantine for a period of ninety (90) days from date of admission to hospital or dispensary.

"2. All military personnel placed in working quarantine because of proved venereal infection will be restricted to the limits of the post, camp or station to which they are assigned and will not leave the limits of the post, camp or station except under proper orders and in the performance of military duty. However, such personnel may visit post theaters, post exchanges, and other places of common assembly on the post.

"3. Upon returning the individual to duty, the medical officer concerned will indicate on the company sick book the fact that the patient is subject to the ninety (90) day quarantine, thereby placing the organization commander on notice as to the individual's status."

By Command of Lieutenant General BRETT:

s/Hugh J. Deeney  
t/HUGH J. DEENEY  
Colonel, Adjutant General's Department,  
Adjutant General.



HEADQUARTERS PANAMA CANAL DEPARTMENT  
Office of The Surgeon

710. V.D.

Quarry Heights, Canal Zone,  
20 May 1943.

SUBJECT: Prophylactic Use of Sulfathiazole as a Venereal Prophylaxis.

TO: Surgeon, A.C., C.A.C., M.F., S.C., each Air Base, X.A.D., Post, Camp, Station and Organization.

1. The prophylactic use of sulfathiazole for the prevention of venereal disease, recently instituted in certain organizations of the Panama Canal Department, makes it incumbent upon all medical personnel concerned to be thoroughly alert to the danger of toxic reactions following its use.

2. Repeated sexual exposure on successive days or several times during the same week will result in the administration of a fairly high dosage of sulfathiazole (4.0 gm. per day) and, as a consequence, blood levels may approach those reached in the therapeutic use of the drug.

3. Toxic reactions which follow the use of sulfathiazole fall into five groups, viz.: gastrointestinal, renal, hematopoietic, central nervous system and dermatological.

a. Gastrointestinal. - Nausea and vomiting are relatively frequent when sulfathiazole is administered over a protracted period. They are unlikely to occur in the course of routine prophylaxis for venereal disease. Unless marked, nausea and vomiting are not contraindications to the further use of the drug. They should be regarded, however, as danger signals to be passed only after questioning and examination have shown that no other signs or symptoms of drug intoxication are present.

b. Renal. - A high concentration of sulfathiazole in the blood, combined with dehydration accompanying the restriction of fluids imposed at the time of administration of the drug, may produce precipitation of the insoluble acethylated form in the collecting tubules and renal pelvis, with subsequent hematuria, oliguria and anuria. Pain over the costovertebral angles or along the course of the ureters is a frequent early complaint indicative of impending renal disaster and may appear as early as the first day of administration. Diminished output of urine or

gross hematuria appear later and are indications for the immediate cessation of sulfathiazole and the prompt increase in fluid intake to effect a thorough "flushing" of the kidneys. Any suspicion of renal pathology calls for prompt discontinuance of the drug until urinalysis can be done and the status of the renal mechanism accurately determined thereby.

c. Hematopoietic. - Hemolytic anemia malignant neutropenia and purpura are the most frequent and feared toxic effects on the blood-forming organs. Usually these complications follow prolonged administration but severe and rapid hemolysis of red cells may occur early and without preliminary warning. There is no certain way to detect changes in the blood except by routine checking of the red count, white count and differential. Weakness, cyanosis, pallor, purpura or jaundice should lead promptly to such examinations. Meanwhile the drug should be withheld.

d. Central Nervous System. - Confusion, disorientation, headache and vertigo are evidences of central nervous system involvement. They are not apt to appear with the doses used in venereal prophylaxis. Nevertheless, the medical officer should be on the alert for any evidence of mental confusion, excessive drowsiness or vertigo.

e. Dermatological. - Dermatitis may assume varied forms. Associated fever and conjunctivitis may occur. Any skin rash or pruritis appearing after the administration of sulfathiazole should be regarded with suspicion and the drug discontinued pending further observation. Fever, without an obvious explanation, is an indication for discontinuing the drug also.

4. The possibility that oral administration of sulfathiazole in repeated doses at varying intervals may sensitize to the future administration of the drug is a matter for careful observation by all medical officers now supervising the use of sulfathiazole in venereal prophylaxis. This question has been incompletely studied and further data is desirable where the opportunity is presented for its collection. Sensitization may be manifested by skin reactions, purpura and other constitutional symptoms.

5. a. The administration of sulfathiazole, particularly the second or subsequent doses, should always be accomplished by a medical officer. The drug should be administered at the post, camp, station hospital or organization dispensary or aid station only.

b. The medical officer should question the patient relative to possible toxic reactions from the use of sulfathiazole or other sulfa drugs.

c. Where there is a history of prior reactions to sulfathiazole or other sulfa drugs, the drug should be given only after due consideration of all aspects of the individual case and the positive opinion of the medical officer that the administration of the present doses of sulfathiazole will not precipitate a reaction.

6. All personnel to whom sulfathiazole is administered as a venereal prophylaxis should be instructed to report to the post, camp, station or organization hospital or dispensary immediately upon the occurrence of any reaction, no matter how slight.

s/Wesley C. Cox  
t/WESLEY C. COX,  
Colonel, Medical Corps,  
Surgeon.



### STATION OR POSITION

**AR 40-210 C 2** e. Early Detection of venereal disease.

REPORT IN ACCORDANCE AR 40-210 C-2 (Note 1)

**NOTE 1. DUE TO THE  
VENEREAL DISEASE.**

Note 2. Enlisted men will not be ordered to write in space (5). Failure to make a notation herein will be construed as a negative report, if venereal disease subsequently develops.



NOTES ON VENEREAL DISEASE CONTROL

The following memorandum is prepared as an outline or type for the use of post, camp, station and organization surgeons and their respective venereal disease control officers for use in the campaign for the prevention of venereal disease among the personnel of the Panama Canal Department. Each surgeon should study this memorandum and prepare a similar one. After obtaining approval of the Commanding Officer the memorandum should be published and copies distributed to each officer on duty with the organization.

1. RESPONSIBILITY. - Commanding officers of all grades are responsible for the control of venereal disease in their command. The control of venereal disease is, therefore, a command problem. However, it is necessary for each medical officer to aid and assist commanding officers of all grades in every way possible. It will be necessary for medical officers to assist in the indoctrination of commanding officers of all grades of the necessity for command action in the reduction of the venereal disease rate and to instill confidence into these officers that by command action the high rate for venereal disease can be lowered and can be maintained at a low level.

2. GENERAL. - Venereal disease is a preventable disease. Commanding officers can confidently assure their men that the measures recommended by the Medical Department for the prevention of venereal disease are effective, if the personnel using these preventive measures will use them as prescribed. Records of this department compiled during the past several years indicate that only 50 percent of the men use prophylaxis in order to prevent infection by venereal disease and that of the men who do not use prophylaxis, there are many who would take this proper measure for the prevention of venereal disease if they thoroughly understood the need for such action. In order to properly indoctrinate the personnel of this department in the need for prompt and effective prophylaxis, it is necessary to impress upon each individual the fact that each time a man has sexual intercourse with a promiscuous woman, or any woman who lends herself to extra-marital sexual relationships, he can assume that he has a venereal disease which has been contracted during contact with this woman. Women of this type are 100 percent infectious and venereal disease is incurred during contact with such women. A prophylactic treatment which is taken is not a preventative of venereal disease in the true sense of prevention, but is the first treatment in the cure of this disease. Fortunately prophylaxis, when taken immediately following exposure and when all the directives are properly

followed, effects a cure in better than 99 percent of the cases. All men should, therefore, be indoctrinated in the fact that prophylaxis is a treatment for the cure of the disease which they have become infected with during sexual contact with a common or promiscuous woman. It must be realized that a man will take a prophylactic treatment to cure himself when he looks upon the possibility of venereal infection occurring during intercourse and not something which occurs only at a later date when the discharge or the sore appears. It will be necessary for each medical officer to thoroughly overcome the objection to prophylaxis by constantly informing all men of the dangers of incurring venereal disease during exposure, the fact that during exposure the infection has taken place, and that the only immediate cure is by immediate treatment by means of prophylaxis.

3. INDIVIDUAL PREVENTIVE MEASURES. a. Continence. The only absolutely safeguard in avoiding venereal disease is by the practice of continence or sexual abstinence. This is 100 percent effective. However, experience has shown that only about 25 percent of the young men entering the Army have practiced continence in civil life. It cannot be expected that the mere entry into the military service will influence the other 75 percent of the men who have become accustomed to regular sexual intercourse. The restraining influences of home life, family associations, friends, public opinion and other advantages which surround the young men of our country in their home communities are not present in this area. When a man goes into uniform and enters upon a new life, which at many times is exceedingly difficult from his point of view, and which he considers monotonous and boring, it is not possible to change his inherent method of living, especially with the limited facilities which are present in an area of this type. Added to this is the change of climate and the change of environment and the idea that he entered the service to lead an exciting life and one of the ideas of excitement in his mind is sexual contact at various times with various types of women.

b. Prophylaxis.

(1) Mechanical prophylaxis. Mechanical protection, i.e., the condom, sheath or rubber is the only mechanical protection available and is the best method of protection for the parts covered because it is employed during exposure and not after infection takes place. It will be noted that the words "during exposure" were used. Personnel must be carefully trained to apply the rubber or condom before entering into any part of the sexual play. Fingers can be readily infected and if the sexual organs are handled with infected fingers, as for example, in the application of the condom or rubber, infection with venereal

disease may take place. The individual should be carefully instructed to apply this method of mechanical protection before any sexual play is indulged in. Likewise, it will be necessary to instruct the individual in the methods of removing the rubber or condom so that the sexual organs will not be infected during the process of removal. The condom or rubber should always be applied with a free space between the end of the penis and the tip of the sheath so that the forceful ejaculation does not burst the sheath and also so that there is sufficient play during the sexual act that the penis does not receive injury. The rubber or condom should not be lubricated with vaseline or other petroleum products as certain types of rubber rapidly deteriorate when vaseline or petroleum oils are applied. Upon completion of the act the condom or rubber should be removed with one downward and outward motion made by grasping the rubber at the base of each side with the fingers and turning it inside out during the removal process so that no infected material touches the sexual organs. The sheath should be discarded immediately, preferably thrown in a toilet or placed in a paper which can be disposed of later. The condom or rubber is the most perfect protection against gonorrhea and is also a very excellent protection against syphilis and chancroid. However, it must be remembered that only the head and shaft of the penis are covered and that other portions of the sexual organs must be protected by a chemical prophylaxis.

(2) Chemical prophylaxis. Chemical prophylaxis is in reality the treatment for the cure of venereal infection which has been incurred during the sexual act, or during sexual play preceding the act. It is 100 percent effective when used properly and immediately after exposure. The following is an outline of the necessary steps which must be taken in a properly completed prophylaxis:

- (a) Thorough washing for the cure of chancroid.
- (b) Urination.
- (c) Installation of a silver salt into the urethra for the cure of gonorrhea.
- (d) Inunction of the exposed portions of the body with calomel ointment for the cure of syphilis.

These steps must be carried out in the following manner in order to successfully cure venereal disease. All parts of the body should be washed immediately after sexual exposure with soap and hot water. This simple act is one of the most important in the cure of the early venereal disease. The organisms of the various

diseases are contained in the gelatinous secretion which not only covers the exposed sexual parts but which may also have been applied to other portions of the body. This secretion is thick and tenacious. It is usually loaded with various types of organisms any of which may cause infection. It is impossible to remove this secretion thoroughly unless hot water and soap are used.

1. Immediately after exposure the hands should be washed with hot soap and water.
2. The face and neck should be carefully washed with hot water and soap.
3. The mouth should be rinsed with an antiseptic mouth rinse or in the absence of this solution should be thoroughly rinsed with soap suds and water.
4. The body from the nipples to the knees should be thoroughly washed with hot water and soap, paying special attention to the penis, the scutum, the thighs, the lower abdomen and the perineum, the area behind the testicles. A good lather should be obtained and this massaged into the skin in order to bring the soapy solution in contact with the germs of venereal disease. After washing, the skin should be thoroughly dried and the chemical treatment for the cure of venereal disease begun.

NOTE: It is advisable in lecturing to men relative to venereal disease to caution them to remove their clothing during the sexual act. In this manner clothing does not become infected with the secretions of the female vagina. Clothing so infected may result in the development of venereal disease, no matter how well the prophylactic treatment is applied, for the infectious secretions contain the organisms of venereal disease and these organisms may be rubbed into the skin by the clothing and thus cause this disease.

Chemical prophylaxis or early treatment of venereal infection.  
At the present time there are two methods of prophylaxis available:

- (a) The V-Packette which can be used at the place of exposure.
- (b) The official Army prophylactic which must be taken at a prophylactic station.

If hot water and soap are not available at the place of exposure it is advisable to use the V-Packette immediately following urination for the V-Packette is an excellent early treatment and will suffice until the exposed person can reach the Army prophylactic station where complete early treatment can be obtained.

The treatment at place of exposure, or at the bedside, may be outlined as follows:

- (a) If water, even cold water, is available, the body should be washed, using a soap lather prepared with cold water. The same careful technique should be used in the washing of the hands, face, mouth and body.
- (b) After washing, the bladder should be emptied. The best results are obtained by emptying the bladder slowly and by compressing the end of the urethra with the fingers and urinating in spasmodic spurts. This is done by alternately compressing and releasing the opening at the head of the penis. By so doing the urethra and the urine washes out any organisms which have gotten into the urethra.
- (c) After urination the jelly in the metal tube with the yellow band about it is carefully squeezed into the urethra by inserting the mouth of the metal tube into the urethra opening and by squeezing the entire contents of the tube into this canal. The urethra is then closed by squeezing the head of the penis between the fingers of the left hand and the medication is held in place 5 minutes. The urine should be held as long as possible following this treatment in order that medication may have full opportunity to act.
- (d) Treatment with calomel ointment. Following the injection of the contents of the metal tube into the urethra the calomel ointment contained in the light yellow gelatine capsule is placed in the palm of one hand. Following this the ointment is spread over the palms of both hands and then massaged into the skin of the penis, the scrotum, the thighs, the abdomen and the area behind the testicles. It is necessary to massage this ointment into the skin and a period of from five to ten minutes of massaging is necessary. Merely applying the ointment to the skin is not sufficient. The spirochaetes, or organisms causing syphilis, penetrate the skin rapidly and it is only when the calomel ointment is massaged into the skin that this chemical can reach these organisms and kill them, thus curing the disease, syphilis.

In the event that hot water and soap are not available, it will be necessary for the exposed person to visit a prophylactic station as soon as possible and take a complete prophylactic, or complete treatment for the cure of venereal disease, as set forth according to regulations.

4. CONCLUSIONS. - a. Venereal disease is contracted during the exposure of the individual while performing the act of sexual intercourse or during the sexual play which precedes intercourse. There is only one method by which venereal disease can absolutely be avoided. This is by sexual continence or sexual abstinence.

b. The use of the condom or rubber is effective 100 percent in protecting the penis from infection, if the condom is properly applied prior to any sexual play and is properly removed.

c. Chemical prophylaxis (early treatment of venereal disease) is 100 percent effective in preventing venereal disease if properly taken immediately following exposure. By the use of the V-Packette and by visiting a prophylactic station following the use of the V-Packette all conditions encountered can be covered and the individual can treat himself perfectly and avoid venereal disease. Chemical prophylaxis is a laborious task. It takes time and in many cases more time than the actual exposure. However, it is the only method by which a man who exposes himself can prevent his becoming infected. The time spent in treating venereal disease immediately after exposure is well worth while and will pay dividends. It takes many weeks to cure gonorrhea; from 3 to 15 weeks to cure chancroid, and 18 months to cure syphilis after the clinical disease has developed, while it takes only a few moments to cure the newly acquired disease following exposure.

d. The reasons given by men for not taking prophylactic measures are too simple to be discussed. They are in reality ridiculous and are merely the reaction of an ignorant and lazy individual who has no desire to protect his health or the health of others. The idea of protection against venereal disease must be sold to this type of man. This is a command function as well as a medical function. Every case of venereal disease is a casualty and commanding officers of all grades should be intensely interested in preventing casualties.

e. Each surgeon, this department, should cooperate in every way to aid and assist unit commanders in the campaign of education and eradication of these diseases.

# VENEREAU DISEASE

PREPARED FOR USE~  
BY UNIT COMMISSIONED  
AND NON-COMMISSIONED  
VENEREAU DISEASE  
CONTROL OFFICERS



HEADQUARTERS  
COAST ARTILLERY COMMAND

OFFICE OF THE SURGEON — OCTOBER 1943



## INTRODUCTION

No pen could trace a fraction of the human misery that has resulted from such diseases as gonorrhea and syphilis. Through the ages these and other venereal diseases have wrought mental and physical havoc among mankind. They have blinded babies, maimed women, wracked men, disrupted families, destroyed homes, denied the sacred right to parenthood and have killed. From early childhood to the grave one constantly hears about the diseases of sex, or as they are commonly called, "venereal diseases". Much of this information is erroneous and is the result of folk-lore and popular misconceptions of the true facts regarding these human plagues.

Fortunately there exists today a more enlightened, changing public and medical opinion regarding these venereal diseases and sex education. This general enlightenment and education cannot be brought about too rapidly, for the present worldwide conflict, like all wars in recorded history is bringing about a tremendous social upheaval which in part favors the spread of venereal disease. The danger is real and is ever present, and unless Americans rise to the situation in all of its complexities we are in grave danger of being overcome by the devastating forces of these venereal diseases.

An increased knowledge relative to the venereal diseases and social hygiene exists and every man, woman and child is directly or indirectly affected. Therefore, let us consider what steps can be taken to improve the techniques which will reduce the spread of disease and the associated unhealthful turmoil. It must be constantly borne in mind that only through education can it be hoped that these diseases may be brought under control. To bear out this latter point it is interesting to point out that the prevalence of venereal diseases is greater among the uneducated elements of the world's population than among the more enlightened groups. Recent studies on men inducted into the Army of the United States has again confirmed this well-known fact that has been reiterated in both medical and lay literature for many years.

The transmittal of knowledge regarding sex and sex diseases to the civilian population is obviously beset with many obstacles. On the other hand the education of the members of the armed services, although not an easy undertaking, should be comparatively facile with the rigid control the military exercises over the daily lives and habits of its members; and the Armed Services have made great strides in this educational program. But much more remains to be done, for venereal disease still takes a high place in the cause of man days lost. Therefore, it is of

profound and vital necessity that the program of enlightenment among the military personnel be intensified and that every echelon of command marshal its full efforts in bringing all elements of our army, both commissioned and enlisted, to realize the seriousness of venereal disease and the urgent necessity for rapid eradication of this plague which, if not checked, will undermine our civilization.

On the following pages an attempt has been made to epitomize the knowledge of venereal disease in all of its aspects. The scope of a work of this size is necessarily limited but will briefly cover the clinical, physical, pathological, and social aspects of the four venereal diseases:

1. Syphilis
2. Gonorrhea
3. Chancroid
4. Lymphogranuloma venereum

### SYPHILIS

(lues, lues venerea, pox)

#### DEFINITION

Syphilis is a chronic, specific, infectious disease, caused by the Treponema Pallida (Spirocheta Pallida). It is acquired by sexual intercourse, rarely by kissing and very rarely by direct contact with infected secretions. It is manifested clinically by an initial lesion of the skin or mucous membrane at the site of entrance of the causative organisms, secondary manifestations involving these same structures, late manifestations in which any tissue of the body is likely to be involved, especially the cardiovascular and nervous system. Syphilis is protean (variable) in character and atypical manifestations are common.

#### HISTORICAL

The complete history of syphilis is not known. It is well within the range of probability that it existed in antiquity and even in prehistoric times, but we have no records to prove its existence before the middle of the 15th Century. In 1495 it broke out in epidemic form in Naples and quickly became one of the disease scourges of the Middle Ages. Its appearance at this time and the route of its spread was probably the reason for the

theory that the disease was brought back to Europe by Columbus and his sailors following his discovery of America three years previously. This theory, while not universally accepted by medical historians, has never been conclusively disproved and today it is rather widely accepted as the true version of its introduction into Europe. Antagonists of the theory claim that it existed in Europe in the form of sporadic (occasional) cases since the beginning of civilization, but this theory is also impossible to prove. In any case, by 1495 it existed in epidemic form, at which time it was variously known in the different countries of Europe as The King's Disease, The French Pox, The Spanish Pox, The Neapolitan Pox, etc., no one country wishing to accept the doubtful honor of giving a name to this "new" disease. It was also known as the "Plague" during its epidemic form (not to be confused with the true bubonic plague) on account of its rapid, raging spread. It must be remembered that at this stage in the history of medicine no one had even imagined the existence of microscopic organisms which could cause disease -- in fact there were at that time no microscopes to foster such a theory. There was, therefore, much confusion regarding the cause of syphilis upon its appearance in Europe. It was variously attributed to the eating of decayed meats, to the peculiar disposition of the heavenly bodies at the time, to the presence of devils in the body of the victim, etc., in fact, its venereal character was not recognized until about 1520, at which time gonorrhea was first described and with which syphilis was often confused. Fortunately, however, physicians of the time had been using an ointment containing mercury to treat such skin conditions as leprosy, chronic eczema and other dermatological conditions, and as a measure of desperation it was tried on the lesions of the new disease and was found to be effective. This treatment continued to exist as the sheet anchor of anti-syphilitic therapy until modern times -- indeed, it still exists as part of our armamentarium in the form of calomel ointment which is used universally as the anti-syphilitic step in the Army prophylactic routine. For 400 years the world lived in ignorance of the cause of syphilis and it was not until 1903 that a Russian named Metchnikoff and a Frenchman named Roux proved the infectious nature of the disease and two years later, two German scientists, named Schaudinn and Hoffman discovered the germ that causes the disease. They named the newly found organism "Spirocheta Pallida". In more contemporary times this name has been changed to "Treponema Pallida". The use of either name, however, is correct.

The name "Syphilis" had been given to the disease long before modern times. During the Middle Ages a monk, Fracastorius by name, wrote a poem about a shepherd who had the disease. The shepherd's name was Syphilis.

As has been suggested above, the treatment for syphilis progressed very, very little until comparatively recent times. In the early 1900's a German chemist and research worker became interested in chemical affinities. He visualized a drug which would kill the germ of syphilis, but would not harm human tissue. Working on this theory, he tried injecting 605 different chemical compounds into laboratory animals with disappointing results. His 606th attempt proved to be the drug for which he had been searching and he named it "Arsphenamine". Its popular name is "606". This tremendous achievement formed the basis of the modern treatment for syphilis and all improvements in therapy are the result of refinements of this scientist's original discovery. His name was Ehrlich. Contemporary modifications of the arsphenamine treatment will be discussed under "Treatment" below.

#### PREVALENCE

Syphilis is endemic in every country in the world today. Its incidence varies from its lowest point, in Sweden, where it is practically non-existent, to certain small localized areas where almost 100% of the population is infected, having acquired the disease congenitally and non-sexually as well as through venery. We know that some 600,000 newly infected persons apply for treatment in the United States each year. We also know that the national average of syphilitics to the population in the United States is about 4% (45.2 per thousand), that the Army average is between 6 and 7 thousand. By States the incidence varies from 170 per thousand to 6.6 per thousand. Rates among the colored population are much higher than among the whites, the diseases being about ten times as frequent. Tables of rates of incidence appear at the end of this compendium for purposes of reference.

A casual consideration of some of the figures quoted above may easily lead to a myopic, optimistic attitude toward the seriousness of the epidemiological problem of syphilis. It must be remembered that figures relative to cases per thousand include all levels of society including the so-called middle and upper classes where the rate is very low, much lower than the general figures. The great number of cases of syphilis is found in that stratum of society variously referred to as the "half-world" or "underworld" -- the level of society which includes the professional prostitute. It is obviously impossible to quote accurate figures on an illegal profession, but various estimates indicate that between 25% and 50% of all prostitutes are syphilitic. We will see in the discussion of prostitution later in this compendium where this fact is all-important in the consideration of the control of syphilis.

## CAUSATIVE AGENT (ETIOLOGY)

The organism which causes syphilis, the Treponema Pallidum, is a delicate, spiral or corkscrew-shaped organism, microscopic in size, which is actively motile. That is, when seen in the living state it moves very energetically in a spiral boring motion. The number of spirals varies from 6 to 24 and it is about 7 microns in length. A micron is one millionth part of a meter or one thousandth part of a millimeter --25,000 of these germs laid end to end would equal one inch. It is a very difficult organism to grow in the laboratory and it is also very difficult to stain under the usual procedures, necessitating special technique for purposes of recognition in the living state.

## INOCULATION AND INVASION

The Treponema enters the body through the skin or mucous membranes (which line the mouth, nose, urethra, vagina and rectum). Abrasion of the skin or mucous membrane favors the invasion of the parasite, but this is not necessary for a successful penetration. THE TREPONEMA CAN PENETRATE THE APPARENTLY INTACT SKIN. It can also be transmitted from mother to unborn child by transmission through the placenta from the blood of the mother to the blood of the fetus. This is the mechanism by which congenital syphilis is acquired.

## SYMPTOMS AND CLINICAL COURSE

The clinical course of syphilis falls more or less naturally into two phases. These are called "Early Syphilis" and "Late Syphilis".

### EARLY SYPHILIS - Includes:

- a. Incubation period. 10 to 90 days. Usually about 21 days. No symptoms.
- b. Primary syphilis. Following the incubation period a hard pimple or ulcer-like chancre is present but in many instances may be overlooked due to its small size or failure to produce pain or discomfort.
- c. Secondary syphilis. Appearance of skin rash, mild or severe.
- d. Early latent syphilis. Symptomless period during the first year.

LATE SYPHILIS - Includes:

- e. Late latent syphilis. Symptomless period after the fourth year.
- f. Cardiovascular syphilis. Syphilis of the heart and large blood vessels. May not appear until 3 to 20 years after primary infection.
- g. Neurosyphilis. Syphilis of the brain and/or spinal cord. May occur anytime from secondary stage to 30 years after primary infection.
- h. Visceral syphilis. Syphilis of any internal organ.
- i. Osseous syphilis. Syphilis of any bone.
- j. Muco-cutaneous syphilis. Ulcers of the skin or mucous membranes.

EARLY SYPHILIS -- The Incubation Period.

As has been stated above, the treponema enters the body through the skin or mucous membrane, wherever infected material may make a contact. It must be remembered that in the case of an infected sex partner, any body secretions may be infectious. This includes the saliva, skin, lesions, if any, breaks in or sores of the mucous membranes, the mucous secretions about the cervix (neck of the uterus, or womb) and vagina. Because almost every case of syphilis is acquired during sexual intercourse, the chancre is found most often in the male on the head of the penis, the shaft of the penis, at the base of the penis, inside the penis in the urethra, but rarely elsewhere on the body. By virtue of its rapid motility, the cork-screw motion, the organism then has penetrated the skin or mucosa at the site of inoculation and the infection is established. Immediately following invasion, the organisms enter the lymphatic channels which drain the point of entry and begin to multiply, meanwhile escaping from the lymph channels into the blood stream from where they are carried to all parts of the body. After a period varying from 10 to 90 days, averaging 3 weeks, a sore or lesion appears at the site of inoculation. The delay between the inoculation and the appearance of the initial sore is called the "incubation period" and represents the time it takes for the organisms to overcome the local tissue reaction or local defense of the body, and form the sore which is called the chancre.

## EARLY SYPHILIS -- Primary Syphilis.

This is the first external evidence of infection. It is the primary or initial lesion of syphilis and is commonly referred to as a chancre ("hard chancre"). The typical chancre (the so-called Hunterian chancre, named after a physician by that name) has a definite appearance and a typical development. It begins as a small red papule or "pimple" or a crusted superficial erosion of the skin which in a few days or weeks becomes more deeply ulcerated, rounded in outline, the edges raised and "pearly" appearing, enclosing a raw central area which is moist with a clear watery fluid. This fluid contains millions of germs (*treponema pallida*) and is highly infectious. The sore is usually painless and does not bleed easily. The lymph glands in the area are usually enlarged and are sometimes tender. It is important to remember that only a small percentage of primary lesions take the form of the typical Hunterian chancre, however. The lesion may vary from a small, hardly noticeable reddish "pimple" to a deeply ulcerated secondarily infected spreading, ugly sore. The lesion is usually single but may be multiple and in a considerable percentage of cases THERE IS NO DEMONSTRABLE LESION. This fact becomes of vital importance in consideration of the spread of the disease. ANY NEW LESIONS ON OR ABOUT THE GENITALS MUST BE CONSIDERED SYPHILITIC UNTIL PROVEN OTHERWISE. At this stage in the disease the Wassermann reaction is usually not yet positive but the clear fluid which exudes from the chancre is teeming with millions of the *treponema* and diagnosis of the disease can be made by examining a drop of this liquid under the microscope with the aid of the so-called dark-field-condensor. This special attachment causes light to be directed against the side of objects in the microscopic field; the objects, that is the *treponema*, glisten against a dark background and become easily visible. Finding the *treponema* in the dark-field examination constitutes DEFINITE PROOF of the presence of syphilis and treatment may begin on the evidence thus obtained.

## EARLY SYPHILIS -- The Positive Blood Test.

If left untreated the chancre tends to disappear spontaneously in from about 3 weeks to 3 months. Although no other signs or symptoms of syphilis appear immediately, the germs are multiplying rapidly throughout the body. The various blood tests for syphilis usually become very strongly positive for years unless the patient is treated. Treatments often cause the blood test to become negative before the patient is cured. During this same period the disease seems inactive and many people wrongly think that they are cured. Actually the disease is penetrating numerous vital organs throughout the body where serious damage will appear years later when it is too late to cure the disease and sometimes too late to save the health of the patient or even his life.

## EARLY SYPHILIS -- Secondary Syphilis.

About the time the chancre disappears, or usually a little before, constitutional symptoms of generalized syphilis appear, but MAY BE SO SLIGHT THAT THE DISEASE ESCAPES DETECTION. These symptoms and signs usher in the so-called "secondary" stage of syphilis and usually consist of a skin rash, sore throat, sores in the mouth or around the body orifices (openings), headaches, generalized pains, the sensation of "feeling bad" and usually a slight fever. This is also an infectious stage of the disease because each moist syphilitic lesion on the mucous membrane is covered with germs. The skin lesions themselves are also filled with germs (*treponema pallida*) but usually the skin is intact and these germs are not on the outside surface. The skin rash may be so slight that the disease escapes detection. This skin rash, the most typical manifestation of the secondary stage, may take one of many forms; it may simulate (imitate or resemble) many other skin conditions such as measles, chicken pox, fungus infections, etc., to the extent that syphilis has earned the title of "The Great Imitator". It is obvious that any skin rash must be regarded with suspicion as being syphilitic in nature until it is proven to be otherwise.

Another frequent secondary lesion is the "mucous patch". This is a flat, grayish appearing, rounded erosion, covered by a dirty, soggy membrane which usually appears on the tonsils, the tongue, the throat and also on the lips, gums, and in the female, inside the vaginal opening. These lesions are, of course, very infectious and it is by means of contact with such lesions in kissing or by using utensils which have come in contact with them that the so-called "innocent infections" or "non-venereal infections" are acquired.

Other evidences of the disease in this stage are the "condyloma" - soft, red, often mushroom-like growths, with moist, weeping surfaces which appear in the folds of moist skin especially around the genital areas; there may be falling of the hair of the scalp, beard or eyebrows. In scalp involvement the areas denuded of hair may be patchy, giving a peculiar moth-eaten effect called "syphilitic alopecia".

## EARLY SYPHILIS -- Latent Syphilis.

If the individual case of syphilis has not been treated, or has had inadequate treatment, lesions of secondary syphilis tend to disappear spontaneously and this stage is followed by a long period during which no external evidences of the disease are noted, a condition somewhat similar to the "incubation period" noted above. The patient has no symptoms which would bring him

to the physician, but slowly and progressively over a period of years the treponema pallida are damaging and destroying tissues in the brain, spinal cord, heart, nerves and blood vessels. This period between early and late lesions of syphilis is called Latent Syphilis. In the Army nomenclature of disease, a latent period which exists less than four years after inoculation is called "Early Latent Syphilis". Cases of latent syphilis are usually picked up by means of routine blood tests. (Wassermann reactions). The length of the latent period varies considerably in different cases. It is not uncommon for the symptoms of late syphilis to appear 20 to 25 years after the disappearance of secondary manifestations. Indeed, not infrequently the victim of such a tragedy has entirely forgotten about the small penile lesion which "just went away" 25 years before he first consulted a physician.

#### LATE SYPHILIS -- The Gumma.

It is in this, the final stage, occurring from 5 to 30 years after acquiring the infection that syphilis becomes the horribly destructive, maiming, killing disease that it really is. It can and does attack any tissue in the body, although it does have sites of predilection; certain tissues which are more often attacked than others. There is obviously not sufficient space in a work of this scope to describe the many lesions characterizing this stage of the disease, but a short discussion of the more frequent processes is essential.

The gumma is the typical lesion of late syphilis. It begins as a small nodule, enlarges slowly, attaining a diameter of 1 centimeter or more. The inner, or central portion of the nodule often undergoes degeneration and dies (necrosis) forming a deep punched-out appearing ulcer. The most frequent location for the gumma is the lower leg, forming ulcers which are often mistaken for varicose ulcers. Bone is frequently attacked, in fact no tissue of the body is exempt, and great disfiguring loss of tissue is the inevitable result. This type of lesion happily, reacts well to treatment even in this late stage.

#### LATE SYPHILIS -- Cardiovascular Syphilis.

One site of predilection for the gumma is the aorta, the largest artery in the body and which leads directly from the heart. The walls of the aorta may become thickened and the heart valves, especially the aortic valve, disfigured so that complete closure is not possible, resulting in back-flow of blood into the heart and eventually causing death from failure of the heart to compensate for the added strain placed upon it.

It may result in the formation of weak spots in the wall of the aorta which is followed by a ballooning out of that portion of the aorta to form a fragile, thin-walled, blood-filled sac (aneurysm) which is easily ruptured, causing sudden death from the resulting massive hemorrhage.

#### LATE SYPHILIS -- Neurosyphilis.

Here again syphilis reacts in a protean manner. It may attack the spinal cord, destroying certain cells which affect the gait, resulting in the familiar "slapping" gait of locomotor ataxia (tabes dorsalis). It may even render locomotion impossible. It may attack the coverings of the brain causing a syphilitic meningitis and as one of the final destructive processes it may invade the brain tissues itself. The unfortunate victim of this form of syphilis gradually loses all intellectual power, he becomes a silly, prattling, insane idiot with eventual complete mental dissolution and he ends his days in an institution where he requires the care and attention of a newly born child. This pitiable and almost completely hopeless condition is known as "General Paralysis of the Insane," or "General Paresis."

#### LATE SYPHILIS -- Visceral, Osseous and Mucocutaneous Syphilis.

In addition to the specific lesions mentioned above, the disease process in this late stage may attack any of the other body tissues. We have already mentioned how the gumma most often attacks the lower leg. Another favorite site is just inside the nose where the developing gumma eventually causes a perforation of the nasal septum. All organs of the body are fair prey for the treponema in this late stage and lesions of the skin are frequent, varying from small, easily overlooked sores to large unsightly fungating growths which often disable the individual completely.

#### CONGENITAL SYPHILIS

We have mentioned that the treponema pallida may penetrate the placenta of the pregnant woman and invade the blood stream of the child-in-utero, the fetus. From the blood it enters all of the glands and tissues of the unborn child, resulting usually in death of the child before delivery. In other instances it may result in extensive skin eruptions, scars about the mouth or blindness in the newly born infant. Stunted growth, mental retardation, bone changes and peculiar changes in the teeth, Hutchinson teeth, are other results of congenital syphilis. The face of the congenital syphilitic with the dimming of the eyes, the sleepy, tired, fagged, clouded or dreamy expression with the peculiar squinting or frowning, the smudging of the feature lines

like a smeared crayon portrait, while almost impossible to describe, is quite typical in appearance. Children showing these stigmata appear all too frequently in children's clinics in company with the mother who very often is entirely ignorant of the fact that it is her syphilitic infection that has doomed the child to a life of conscious inferiority and hopeless inaptitude.

There is no such thing as "hereditary syphilis." Syphilis in the new-born is contracted only in the manner just described and has nothing to do with true heredity as associated with color of hair and eyes, stature, disposition, and tendencies toward certain physical characteristics.

#### TREATMENT OF SYPHILIS

Ehrlich announced his tremendous discovery of arsphenamine in 1912. After suitable clinical trial, it was universally adopted as the specific medicine for the treatment of syphilis. It did not prove to be, indeed it was not represented to be, the perfect specific, however, arsphenamine is an arsenic compound and like many another arsenic compound, it in itself was toxic, that is, it was mildly poisonous. Many patients could take only a limited number of injections of 606 before becoming poisoned from the drug; others could not tolerate it at all. Also, treatment with this drug usually took a minimum of 18 months before a cure could be expected. Since 1912, therefore, millions of dollars have been spent on research to find a drug, or drugs which would not have these undesirable characteristics. Some of the drugs which have been developed as a result of all this work are neo-arsphenamine (916), silver arsphenamine, sulf-arsphenamine, tryparsamide, and finally mapharsen. The last named drug is now used almost universally in this country in the treatment of syphilis. The heavy metal drugs, mercury and more particularly the recently developed bismuth compounds are used as adjuvants to the arsenic drugs. The curative action of these drugs proceeds at a much slower pace than that of the arsenicals, but it exerts a prolonged and steady influence on the disease and is particularly well adapted for certain forms of syphilis. Attempts to shorten the period of treatment have resulted in experiments in different rates of administration of mapharsen ranging from one injection per week to a continuous drip treatment over a period of a few days, with and without artificially induced fever as an adjuvant. In evaluation of the different methods of treatment undergoing experimentation, it must be said that the ultra-rapid cure, that is, cure within a few days of intensive treatment, is still highly experimental. It is dangerous and may yet prove to be entirely impractical. The United States Army has adopted what is probably the sagest, sanest, and yet as satisfactorily rapid a method of

treatment as is obtainable in any syphilis clinic in the world today. Duration of the course is 6 months in an early uncomplicated case. Mapharsen is given twice weekly for twenty of the twenty-six weeks in the form of injections in the vein of the arm, along with bismuth injections in the muscle of the buttocks.

There is a rest period of 6 weeks in the middle of the course during which time bismuth alone is given.

Further details of treatment have no place in this compendium. It must be remembered that syphilis, being so variable in its manifestations, requires different treatment in different cases. Treatment should be instituted immediately after the diagnosis of syphilis is established. The best results, of course, are obtained when diagnosis is made and treatment begun during the chancre stage, before the appearance of the positive Wassermann test. With the best available treatment, the "chance of cure" during this stage is approximately 100%. In the primary stage, with positive Wassermann reaction this figure is about 95%; in early secondary syphilis, from 80% to 90%. Inadequate treatment is worse than no treatment, especially in early stages of the disease, as it seems to predispose to more frequent relapses. In summary, the following three points must be considered to be of the greatest importance:

1. Treatment MUST begin as soon as diagnosis is established.
2. The full schedule of treatment MUST BE COMPLETED.
3. Treatment must be absolutely regular with NO LAPSES.

#### THE DIAGNOSIS OF SYPHILIS

The diagnosis of syphilis is never made without absolute laboratory proof. No matter how typical or suggestive the symptoms or characteristic the signs or lesions may be, treatment is NOT started until one of the laboratory procedures enumerated below actually proves that syphilis is present.

The dark-field examination. This has already been mentioned above. As stated, a dark-field examination, which in the hands of a competent laboratory technician, demonstrates the presence of the actual organism (the treponema pallida) in any lesion of the body, proves the presence of syphilis. This test is usually used in the chancre stage only as it is very difficult, technically, to obtain material for examination from the much smaller and usually drier lesions of secondary syphilis. Further, the blood Wassermann test is always positive in secondary syphilis and this test is usually used in that stage. While a positive dark-field is conclusive evidence of syphilis, a NEGATIVE DARK-FIELD EXAMINATION MEANS ABSOLUTELY NOTHING. It merely indicates the necessity for further dark-field examinations, or in cases of further failures, repeated blood Wassermann examinations.

The Wassermann reaction. Named after a German scientist by that name, the Wassermann test is a highly complicated laboratory procedure which reveals, indirectly, the presence of syphilis in the body, by an examination of the patient's blood or spinal fluid. Other tests of blood and spinal fluid often taken as a check on the Wasserman reaction are the Kahn test, the Eagle test, etc. In the presence of any suspicious clinical lesions, a single negative blood Wassermann, like the negative dark-field examination, does not mean that syphilis is not present. It merely requires further and repeated examination of the blood or spinal fluid. Also, a single positive Wassermann examination, except under very unusual circumstances, is not used as conclusive proof of the disease. Repeated positive blood examinations are necessary before treatment is begun. Under vigorous treatment the positive Wassermann reaction tends to become negative again and this fact is used by the physician to determine the progress of the disease and as a guide to determine the eventual "cure." In some patients, however, the positive reaction remains constant through life in spite of treatment. These people are said to be "Wassermann fast."

The Spinal Fluid Examination. When syphilis first begins to attack any part of the nervous system, certain changes appear in the fluid which constantly bathes and protects the brain and spinal cord, the so-called "spinal fluid." Laboratory examination of this fluid detects the fact of the invasion by the treponema and no course of treatment is complete until such an examination is done to rule out the imminence of tabes or paresis. The spinal fluid test should be performed after treatment is started in primary and secondary syphilis and, if negative, repeated at the end of the treatment period. In latent syphilis it should be performed at once to prove the absence of neurosyphilis, the presence of which would alter the treatment plan. When spinal fluid examination is positive, it is repeated every 2 to 6 months to determine progress resulting from the treatment.

#### SYPHILIS AND MARRIAGE

Most of the responsibility for syphilis in marriage can be laid squarely on the pre-marital and extra-marital sexual exposures of the man. Different investigators of this phase of syphiology offer statistics that reveal that as many as 90% of such infections are so acquired. Knowledge of such a situation points directly to the problem of prostitution as do so may other aspects of the epidemiology of this disease. A detailed discussion of this phase appears below.

The question of fitness for marriage following a syphilitic infection is a very, very difficult one to decide. It is, in the first place, a question for the attending physician to ponder.

Each individual case of syphilis requires separate consideration on his part. All details of the course of the disease, length of treatment, response to treatment, physical condition at the time, possibility of relapse, etc. must be considered before a decision is made. THERE IS NO INFALLIBLE TEST, NO LANDMARK OR MILESTONE IN THE DISEASE WHICH, ONCE PASSED, WILL INDICATE FITNESS FOR MARRIAGE.

In general, repeated negative blood and spinal fluid examinations, regular physical examinations by a physician and a prolonged symptom-free period (at least 2 years) is required. In complicated cases a much longer period is desirable.

Above all, it is unpardonable dishonesty to withhold the facts of a previous infection from the marriage partner, no matter under what circumstances or for what reasons such information is concealed.

## GONORRHEA

### DEFINITION

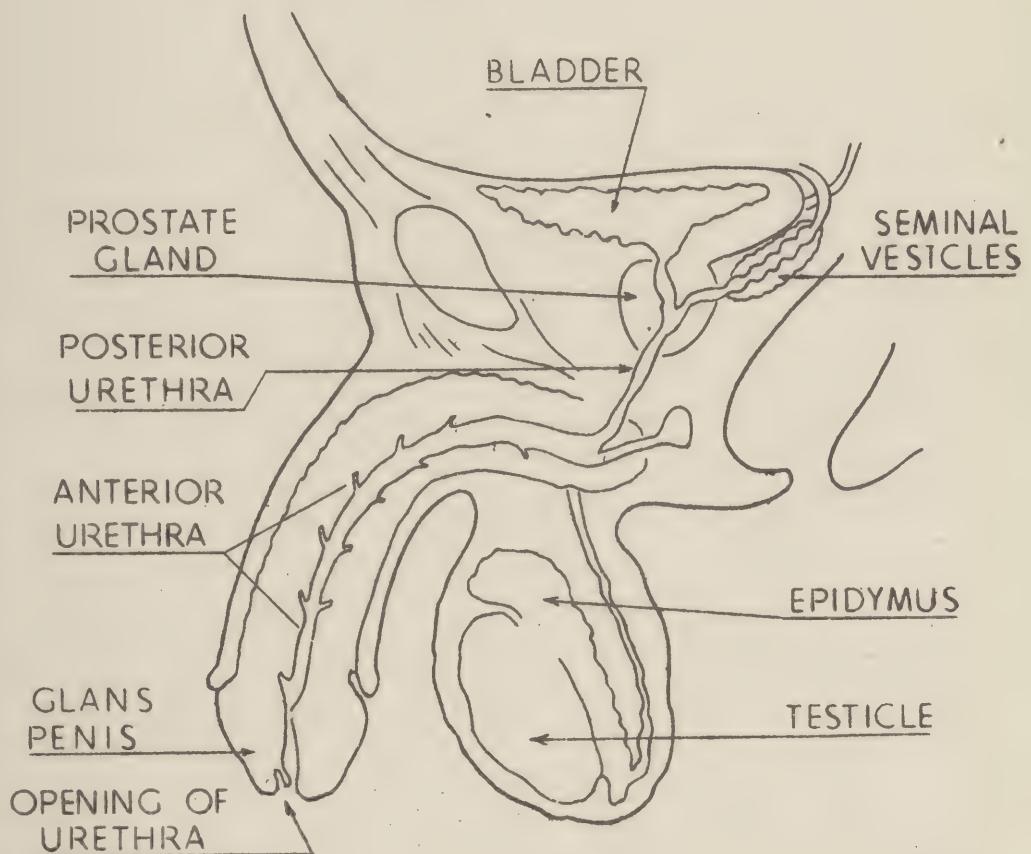
Gonorrhea is also known as Clap, Gleet, Running of the Range, Strain, and many other misnomers. It is an infectious disease caused by the gonococcus. Predominantly, it is a mucous membrane disease and shows a decided predilection for tissues of the genito-urinary tract and the conjunctiva of the eye. Occasionally it also affects the lining of the joints, heart, and the liver. Common opinion regards it as a mild disease, that is, "no worse than an ordinary cold." As a matter of fact, gonorrhea is one of the more serious infectious diseases and its complications are painful and disabling; it may invade the blood stream, attack previously damaged heart valves and produce death through septicemia - a growth of germs in the blood stream itself.

### HISTORICAL

Very little is known of the early history of gonorrhea other than the fact that it made its appearance about 1520. The most remarkable effect of its appearance was suppression of common public baths which were frequented indiscriminately by men and women alike, all of whom sat and bathed together in a common vat or tank.

For many years gonorrhea and syphilis were thought to be one and the same disease. This was taught by John Hunter who was considered an authority on the subject until 1838 at which time a

# MALE



# FEMALE





treatise was written by Philippe Ricord who established the separate identity of the two diseases. The causative organism was discovered in 1879 by Albert Neisser and was given the name Neisseriae Gonococcae. Following this, contributions as to the treatment and complications were numerous and constant.

#### ETIOLOGY

Like the disease it produces, the gonococcus got a bad etymological start, for the meaning of its name is "a berry-like organism that causes a flow of semen." It is not berry-like and no one would mistake the discharge that it produces for semen in these more enlightened days. It appears under the microscope as a small organism likened unto the flat side of a coffee bean and it occurs in pairs. Unlike most other organisms it is not quickly digested by the pus cells (white blood cells) so that it stains deeply and evenly both inside and outside of the cells. It takes the gram-negative stain and grows only in the presence of air; it can be cultivated on special media with a certain amount of difficulty. It is very frail outside the body, dies upon drying, and is easily killed by weak germicides. They are however, difficult to destroy once they have invaded the tissues of the body.

#### APPLIED ANATOMY

In no disease is it more essential that one have knowledge of the structures involved than is the case with gonorrhea. In the following diagrammatic views the parts affected are shown. (See diagram #1).

#### TRANSMISSION

Infection is almost invariably due to sexual contact, accidental infections being of the rarest occurrence, if it ever occurs. Occasionally fresh discharges may be conveyed to the eye by such means as contaminated towels. Among the many peculiarities of the gonococcus, the one of greatest good fortune to the human race is that it dies immediately upon drying. This fact greatly limits its spread to those individuals whose susceptible mucous membranes come into contact with fresh gonorrheal discharges.

Female children, lacking the protection of pubic hair and having the more susceptible "baby type" vaginal mucous membranes, are subject to greater risk of infection by accidental contact with infectious secretions from a nursemaid, parent or guardian.

It must be borne in mind that the female may transmit the infection to a male immediately after having exposed herself to an infected male. In this case the vagina acts merely as a receptacle in which the infectious material is deposited and transmitted by direct contact. This may occur even after so-called douching is used.

The most important factor in the transmission is the asymptomatic female who, in spite of repeated sexual exposures and the indiscriminate use of alcohol, which ordinarily exaggerates symptoms, remains asymptomatic over periods of months.

#### PREVALENCE

It is impossible to arrive at correct statistics, not only due to the great secrecy in which this disease is held, but also due to the activities of quacks, charlatans, and unethical druggists. It is known to be the most prevalent of the venereal diseases, occurring from three to seven times as often as syphilis. It is estimated that several million new cases occur each year in the United States alone. It is agreed that sexually promiscuous people are constantly in great danger of infection unless prompt and perfect prophylaxis is used. Professional prostitutes and other very promiscuous persons almost invariably become infected.

#### INCUBATION

Incubation period is that time elapsing between the implantation of the infectious material and the first clinical manifestation of the disease. In gonorrhea this usually amounts to from two and a half to 10 days, usually 5. Evidences of infection over a much longer period of time are, generally speaking, mild unnoticed gonorrhreal infections stirred to activity by either alcohol or sexual excitement. Likewise, attacks occurring in less than 48 hours after exposure are recurrences of an old gonorrhea or represent infection acquired by still another sexual contact at an earlier date. In such instances the last sexual partner may have been infected by the patient and does not represent the source of his infection.

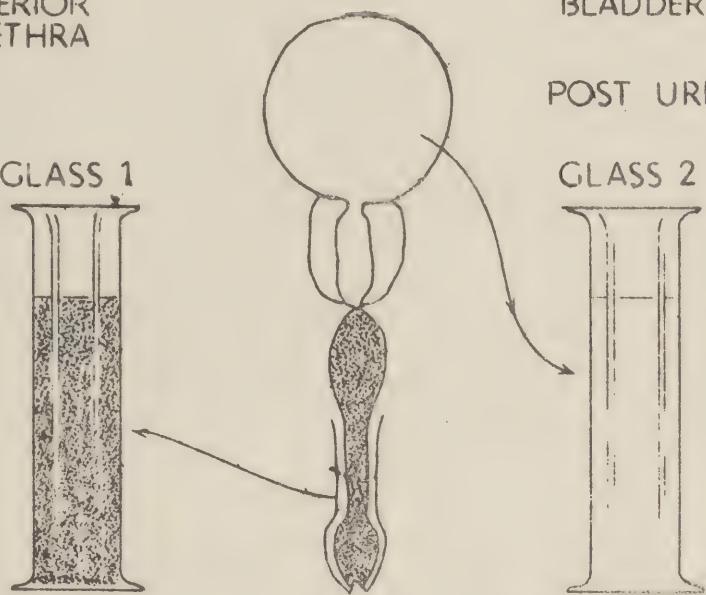
#### SYMPTOMATOLOGY

The symptoms of gonorrhea differ in severity in different individuals. In most individuals there occurs a slight itching at the opening of the urethra (tube-like structure leading from the bladder) and burning while passing urine, followed by the appearance of a discharge. This discharge may be scanty and the

# GLASS TEST OF URINE

ANTERIOR  
URETHRA

GLASS 1



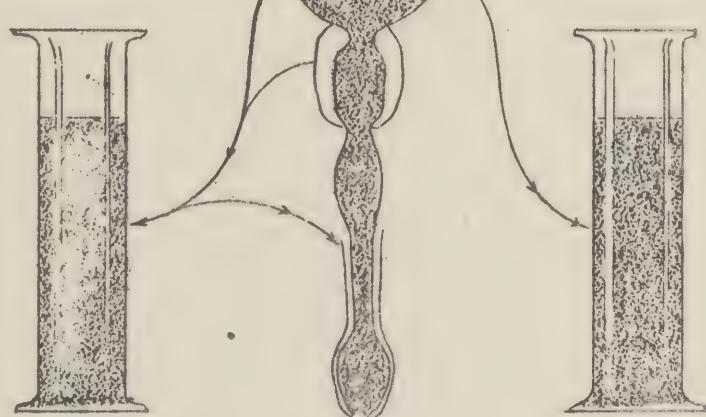
BLADDER

POST URETHRA

GLASS 2

ANTERIOR URETHRITIS

TO



ACUTE ANTEROPosterior URETHRITIS



burning may be very slight; it may vary from a thin watery material to a creamy yellow pus. The more severe early symptoms usually develop in those persons who consume alcohol or indulge in sexual intercourse during the incubation period.

As long as the infection is confined to the anterior portion of the urethra the symptoms are usually limited to burning, slight pain on urination, and a varying amount of discharge. If the infection extends to the posterior portion, the prostate gland and the bladder become involved causing frequency of urination, painful urination, intense back pain, and in many cases elevation of temperature (fever). During the presence of anterior urethritis alone, the urine, if passed into two glasses shows a cloudiness of the first glass, due to the presence of pus in the anterior urethra, while the second glass is clear. With the onset of an infection in the posterior portion of the urethra, the second glass of urine also becomes cloudy due to the presence of pus in the bladder (as shown in diagram) and/or the numerous glands at the posterior urethra which are partly emptied when the flow of urine is stopped between the filling of the first and second glass.

Few diseases differ more widely in symptoms they produce in different individuals than does gonorrhea in the female. In many women there are no recognizable symptoms, and in 75% the symptoms would be classified as mild or moderate. Symptoms pass through all gradations from the entire absence of all symptoms to the most pronounced pain and discomfort associated with fever, profuse discharge, and extreme pain in the lower abdomen and bladder. Uncomplicated infections in women limit themselves to the urethra, to the glands situated about the opening into the vagina, and to the cervix (mouth of the womb).

#### DIAGNOSIS

Diagnosis must be discussed separately for males and females. In males the diagnosis of gonorrhea should never be made on the basis of clinical signs and symptoms. In the army the diagnosis is never made unless the causative organism (gonococcus) can be demonstrated by microscopic examination within pus cells occurring in a smear made from the discharge. Cases of urethritis caused by organisms other than gonococcus may occur making it necessary that repeated examination of smears be made to be certain that one does not have gonorrhea. Where cultural methods are available they should be used.

In the female the diagnosis is much more difficult. Many women exhibit no signs or symptoms from the start and it is also true that many very quickly pursue a complete cycle of acute, subacute, and chronic before they are seen by a physician. It has been demonstrated by authorities that when a woman is infected by a man whose symptoms have been reduced or obliterated by sulfathiazole (or some other sulfonamide drug) she becomes a symptomless carrier and remains so for varying periods of time. Therefore, it becomes of greatest importance that we thoroughly understand the limitations of diagnosis and the fact that health examinations of females, no matter how often and how carefully done, are of limited value. Only when well conducted cultural methods are generally used is it that the diagnosis in the female can be of definite value in the control of the spread of gonorrhea, even when they are medically examined.

Prior to the introduction of the sulfonamide drugs (1937) (sulfanilimide, sulfathiazole, sulfadiazine, sulfapyridine) treatment consisted of the injection of certain drugs into the urethra. The effect of these drugs is only to cleanse and stimulate the mucous membrane to overcome the infection. Some of the drugs used are mild protein silver, strong protein silver, acriflavine, potassium permanganate, and silver nitrate. Internally urinary sedatives were given to help in giving relief to the pain and frequency of urination. Only a small part of this treatment was given in the physician's office and the bulk of the injections were left to the patient. The job was a messy one and in many instances was improperly done. Too often the use of these drugs was increased to the point where they brought about trauma and tissue damage leading to a chronic stage of the disease.

With the advent of the sulfonamide drugs revolutionary changes occurred in the treatment of gonorrhea. The details of the use of these drugs will not be explained but it must be added that there is increasing evidence that many asymptomatic carriers are created and we should exercise great care in determining cures. Most authorities recommend a combination of the sulfonamide drugs and the injection of protein silver drugs locally. This is particularly true of cases with involvement of the posterior urethra.

The use of the sulfonamide drugs caused many people to think that the treatment of gonorrhea had become a very simple matter and that it would only be a matter of each case going to the corner drug store and buying little white pills. This has caused disastrous results. Gonorrhea is still a disease which requires the careful consideration of a well-trained conscientious physician and no person should resume a normal sex life or the use of alcohol until certain tests of cure have been used.

## COMPLICATIONS

Complications of gonorrhea occur frequently in those cases who attempt self-treatment and those cases that are badly managed. The most common are strictures (narrowing of the urethral tract); prostatitis (infection of the prostate gland); abscess of the prostate; epididymitis (infection of the tube-like structure coiled at the back of the testicle); adenitis (infection of lymph glands in groin); arthritis (infection of joints); seminal vesiculitis (infection of saculated portion of tube leading from testicles); phimosis (inflammation of foreskin and inability to retract foreskin); paraphimosis (inflammation of foreskin which has been retracted and cannot be returned to normal position); balanoposthitis (inflammation of the glans penis and its apposed portion of foreskin); phlebitis (inflammation of veins of penis); lymphangitis (inflammation of lymphatics which drain penis; this is usually due to sexual intercourse or masturbation during treatment); parafrenal abscess (abscess of glands located on each side of the frenum or "G" string).

In the female, complications are of even more serious nature. Sterility may occur in either sex. Blindness frequently results in the eyes of infants who are infected during or shortly after birth. Occasional blindness also results from infection of the adult eye with the gonococcus. When the tubes become infected it often leads to scarring and obliteration of the opening, making it impossible for pregnancy to take place.

## CHANCROID

### DEFINITION

Chancroid is a disease which is contracted during sexual intercourse and is characterized by ulceration of the external genital organs and inflammation of the regional lymph glands. It has been termed "soft chancre" in contradistinction to the chancres of syphilis which has been termed "hard chancre."

### ETIOLOGY AND INCIDENCE

This disease is endemic in all parts of the world and there is no especial racial susceptibility. It has been described as a disease of filth. It is caused by a specific organism known as the "Bacillus of Ducrey."

## INCUBATION PERIOD

The onset of chancroid occurs 3 to 5 days after exposure.

## SYMPTOMS AND COURSE

The earliest symptom is the appearance of one or more pimples or blister-like sores usually on the external genital organs, but sometimes on skin areas elsewhere. These quickly break down with the formation of open sores or ulcers which tend to enlarge, burrow, and destroy tissue.

Soon thereafter there is usually involvement of the glands in one or both groins, which, when inflamed, are called buboes. If untreated these often suppurate (form pus) and require incision and drainage. The sores are indolent and slow to heal regardless of treatment. Chancroids often occur concurrently with the initial sore of syphilis and microscopic examination of the serum or pus exuding from the sore is necessary to determine the nature of the disease.

## PREVENTION

Chancroid is practically always preventable by the simple expedient of properly using a condom during non-marital sexual intercourse and by thoroughly washing with soap and water immediately thereafter. The water should be hot in order to be a proper solvent for the secretions which adhere to the genitals and the soap should be of the liquid variety such as is used in the regulation army prophylaxis.

## TREATMENT

Many forms of treatment for chancroid have been advocated. Formerly cauterization of the sores with strong acids or oxidizing agents was employed. Wet dressings or application of powder drugs or ointment on the lesion as well as medication by mouth is usually indicated. Occasionally the bubo must be drained by the use of the needle or even a surgical incision.

## LYMPHOGRANULOMA VENEREUM

## SYNONYMS

Synonyms for this disease are: Venereal lymphogranuloma, Lymphogranuloma inguinale, Climatic bubo, Tropical bubo and Durand-Nicholas-Favre disease.

## NATURE AND INCIDENCE

Lymphogranuloma venereum is much more prevalent than previously realized. It is found in all parts of the world. So far as is known, it is only transmitted during sexual intercourse. This disease is found most frequently in negroes.

## ETIOLOGY OR CAUSATION

The causative agent has been identified as a virus. A virus is a disease producing agent too small to be seen by the ordinary microscope. The size of these agents is determined by their ability to pass through special filters or mechanically with the aid of centrifuges similar in design to the kind used in separating cream from milk. The presence of the agent is demonstrated by its ability to produce a typical disease in laboratory animals.

## SYMPTOMS

The disease first manifests itself by the appearance of one or more pimples or blister-like sores on the external genital organs 1 to 3 months after exposure. This initial sore is not easily recognizable and may go unnoticed with the first symptoms appearing in the form of buboes or swollen lymph glands, in one or both groins. These buboes are painful, tender, and tend to break down with pus formation. The overlying skin becomes discolored and finally ruptures, usually at several points with the formation of multiple discharging sinuses.

In woman an ulcerative-scarring process involves the external genitals and rectum, causing painful and incapacitating strictures.

## THE FREI TEST

This test has proven to be fairly reliable. It is performed by injecting a small amount of material (known as antigen) into the skin. The resulting skin reaction indicates the presence of disease, but not its present activity.

## TREATMENT

Treatment has never been satisfactory, but a combination of Frei Vaccine, fever therapy and sulfonamide administration is the treatment of choice and will undoubtedly cure many cases.

## PROSTITUTION AND VENEREAL DISEASE

Whenever and wherever there is a rapid increase in population whether it be the organization of a new industry, the development of a military installation or other sudden economic boom the natural increase in pay-roll attracts almost immediately a certain group of cheap promoters or racketeers who like to refer to themselves as "the entertainment industry." This statement is not intended to include the legitimate and wholesome means of entertainment usually available in such communities; it refers to the cheap honky-tonks, taxi-dance joints, many "juke joints," and a certain type of tourist camp - that certain "underworld fringe" which attempts to mask their activities as promoters of the profession of prostitution. There is no denying that the great pool of infection, as well as the greatest single factor in the spread of venereal disease, lies in the practice of commercialized prostitution, and no discussion of venereal disease is complete without some consideration of this profession and its effects on national health.

In many of the infectious diseases with which we have to deal such as malaria, the intestinal diseases, typhus fever, etc., the disease is spread by an impersonal mosquito, fly or louse. We can effectively deal with these diseases by wiping out or attempting to wipe out the carriers, by actual killing of the adult, or by preventing development of the young. The carrier of syphilis or gonorrhea, however, is either a man or a woman. These carriers cannot be eliminated like insects - they must be handled or controlled in an entirely different manner and it is this control which represents one of the greatest public health problems in the United States today.

Every city of any size has its problem of prostitution. Several different methods of dealing with this problem have been tried in various localities and these methods can be summarized into two general policies as follows:

1. Segregation and control of prostitution.
2. Suppression of prostitution.

### SEGREGATION

In certain localities it was thought that this was the answer to the prostitution question. Prostitutes were given a "license" either legally or through extra-legal channels; they were set up in houses or rooms in segregated districts, the so-called "red-light" districts, and were examined by physicians at regular intervals in the false hope of preventing venereal disease. This was considered a very common sense attitude toward the question --

this was the "no-use-trying-to-stop-prostitution, we-will-accept-the-situation-and-control-it" idea. A series of similar experiences in different parts of the United States has proven that this type of control of prostitution SIMPLY DOES NOT WORK. That is, such districts (red-light districts) actually cause an increase in venereal diseases - not only do medical statistics prove this, a little practical reasoning will show why an increase in disease incidence is to be expected.

First: MEDICAL INSPECTION OF PROSTITUTES IS NOT EFFECTIVE IN PREVENTING DISEASE. Examination of prostitutes by a physician is necessarily a superficial one. The primary lesion of syphilis, the chancre, does not usually appear until three weeks after the individual is infected. Occasionally the lesion is so small or is so located as not to be detected even on careful examination. Also the blood Wasserman does not become positive until as late as six weeks following infection. Thus, a case of primary, infectious syphilis may be easily overlooked. Also, even though a prostitute may be free from infection at the time of examination, she may become infected by the first man she has contact with following the examination, or she may act as a carrier for germs which she can transfer from one customer to another before she has clinical manifestations. PHYSICIANS ADMIT THAT EXAMINATION OF PROSTITUTES IS AN INEFFICIENT AND UNTRUSTWORTHY PROCEDURE.

Secondly: Segregation causes increased contacts which in turn mean increase in disease rates. When a prostitute is "set up" in a protected house or district her "customers" know where they can always find her; they know that they are protected against legal action and in many instances are lulled into a sense of false security because they know that she is regularly examined. As a result, the satisfying of the sex urge becomes a simple problem and the individual prostitute often builds up a surprisingly large "clientele." Exposures up to fifty by one woman per night are not uncommon and in certain areas there are authentic records of over seventy exposures in one evening. It needs only the application of simple grade-school arithmetic to reveal that venereal disease must be considered an "occupational hazard" by those who practice the "oldest profession." PROSTITUTES ARE DISEASED. Medical records over a period of 25 years indicate that 50% to 90% of all prostitutes in the United States have syphilis, gonorrhea, or both.

#### SUPPRESSION OF PROSTITUTION

We have seen how segregation allows a great increase in the number of contacts by the individual carrier and thus increases the probability of infection. If the prostitute were to be denied a license, deprived of her "protected" house or district and the practice of her profession made illegal, she must, if she wishes to persist in her activities, seek her customers on the streets as pick-ups -- she must do her own "missionary work." This

obviously results in fewer contacts per night, probably no more than four or five. Fewer contacts means less exposure to disease and therefore less syphilis and gonorrhea. Even clandestine contacts and infections from the "pick-up or "sea-gull" type of prostitute decrease under intelligent repression of prostitution. This is true because of the difficulty in keeping prostitutes in the houses provided for them in the legalized districts -- there is, in fact, more clandestine prostitution in cities where "red-light" districts are tolerated than in cities that have adopted repressive tactics. Repression then is a much more sane and workable system than that of segregation in the public health sense.

#### THE "ROMANTIC MYTHS" OF PROSTITUTION

Certain popular misconceptions regarding commercialized vice have existed for many years and one still occasionally hears carelessly uttered remarks by individuals who simply do not know the facts. Here are a few of these "romantic myths;" let us examine these statements coldly and in the light of actual facts as we know them.

"Prostitutes can't afford to be diseased, it is ruinous to their business so they see to it that they stay clean." This statement is simply a stupid absurdity. A review of what has already been said in regard to frequency of exposure reveals that. Also, prostitutes actually know very little about the venereal diseases, they have not been educated in the medical aspects of these diseases; furthermore a large percentage of them are mentally deficient.

"A prostitute is smart, she knows it is only good business to keep from giving her customers a venereal disease." The medical profession knows of no drug which will prevent an infection from being passed on from the female to the male. We know that prostitutes are not skilled medically; they are NOT smart. They are prostitutes not because they have planned to become prostitutes from an early age; they are in the profession as a result of failure of other aims or ideals before they actually decided to do so. Many have psychopathic personalities which accounts for them being engaged in prostitution. Should an individual of normal intelligence and good health depend on the "skill and knowledge" of a feeble-minded, psychopathic failure to protect the health? There is only one answer.

"Prostitutes make good money; they pay high fees for the best medical care." Another complete absurdity. There are a few "successful" prostitutes who, being above the average in intelligence, deal with a very limited, monied clientele -- the "kept woman" type -- but they are very few and do not represent the problem with which we are dealing. Prostitution is a poorly paid, exploited profession from which the girl realizes very little monetary reward for herself. There are madams, procurers, "contact men," and other cheap racketeers who see to that. In regard to medical care, it is very often necessary to force prostitutes to take treatments for diseases they already have contracted, EVEN WHEN IT IS GIVEN TO THEM FREE OF CHARGE. They lack the intelligence to take advantage of any possible benefit from expert medical advice.

"A man has to have sex experience in order to obtain full adult development; it is better for him to go to a licensed woman than take a chance on a "pick-up." Continence has been, is being and will continue to be practised without harmful influence on the male. Satisfaction of the sex appetite is NOT necessary. On the other hand, excessive sexual indulgence may result in exhaustion of the testicular cells which produce the sperm and a relative or absolute impotence and sterility may occur. Such a statement as appears above is usually made by one who is attempting to justify his own sexual irregularities. In regard to the second half of the statement, there is poor choice indeed. Both are in the same profession, both are exposed to the same hazards, both contribute heavily to the venereal disease rates and, as we have already repeatedly stated, PROSTITUTES ARE DISEASED. In the words of one modern syphilologist: "As far as venereal disease is concerned, prostitutes are divided into three classes:

1. Those who have had it.
2. Those who have it.
3. Those who are going to get it."

#### VENEREAL DISEASE PREVENTION

Venereal diseases are preventable. Venereal Disease Control Officers and non-commissioned officers, after thoroughly acquainting themselves regarding prophylaxis, should assure their men that the procedures recommended by the Medical Department are 100% effective if used as prescribed. Records indicate that only about 50% of the men use preventative measures and we believe that if these measures were thoroughly understood more men would use them.

The men who do not use them must be made to realize that a continuation of these indiscriminate exposures will eventually lead to infection.

The methods available may be classified as follows: (1) the prevention of exposure whenever possible (2) prophylaxis before exposure (3) prophylaxis after exposure.

(1) Continence is the only absolutely sure method of preventing venereal diseases. This would reduce the rate faster than any mechanical or chemical prophylaxis known today. Unfortunately, sexual continence is not always a method on which we can solely depend. Continence is not always practised by men in civil life where they are surrounded by what might be termed the restraining influences of home, family, friends, and public opinion; and where they are provided with the contacts and amusements which make up a normal social existence. Young soldiers, then, cannot be expected to change their characters with the donning of a uniform, particularly those on duty in foreign places where restraining ties of the home are removed and recreation facilities are limited. However, this method deserves utmost consideration and an effort should be made to remind the men of their moral obligations to their families.

(2) Prophylaxis before exposure. The use of the mechanical prophylaxis, rubber condom or sheath is the only real prophylaxis, in one sense of the word, in that it is the only method that can be applied before exposure. The rubber condom is the most practical method available, if properly used, in that it is readily obtainable, cheap, easily carried, quickly disposed of, and protects both partners.

The rubber should be one of good quality and one which has been inspected and tested to see that it is intact. Generally speaking most rubber sheaths made in the United States today are satisfactory, but all stocks should be examined intermittently to be sure that those available are in good condition and an adequate supply is on hand.

The rubber should be applied before any type of sex play takes place because infectious material may be transferred by the hands from the female to the penis. The penis should not come into contact with the woman prior to applying the condom. The man's soiled fingers should be cleaned before the condom is applied. The condom should be rolled into a flat disc with a firm rolled circumference. The flat surface should be applied to the head of the penis and the condom unrolled down over the penis. This prevents entrapment of air which would expand during sexual intercourse and possibly

rupture the condom. It should not be covered with vaseline or any other petroleum product, but it is good practice to lubricate with merthiolate ointment or any type of water soluble jelly. Vaseline and petroleum products cause such rapid deterioration that the rubber may be weakened enough during a prolonged sex act to cause breaking.

After completion of sexual intercourse the rubber should be carefully removed with one downward and outward motion, turning the rubber inside out so that the outside, which is covered with infectious material, never touches the fingers or any part of the body. The proper application and removal of the rubber should be demonstrated to the men by the use of a broom handle.

Used rubbers should be immediately discarded by throwing into a toilet or wrapping in a paper to be burned later. They should never be thrown on the street, lawn, or roadside where they might be picked up by innocent children.

Emphasis should be placed on the fact that the rubber protects only while it is in place and only the part of the penis that it covers. While most venereal diseases are contracted on the penis it must be remembered that any other portion of the body, namely fingers, lips, scrotum (the sac that contains the testicles, or balls), lower part of abdomen, and inner part of the thighs, is subjected to infectious material. Fingers will transmit infection to the eye, or this may happen following the use of contaminated wash cloths and towels.

IT MUST BE CLEARLY UNDERSTOOD THAT THE RUBBER IS THE FIRST LINE OF DEFENSE AGAINST VENEREAL DISEASES AND THAT THIS IS THE ONLY METHOD OF PROTECTION BEFORE THE INFECTIOUS MATERIAL IS DEPOSITED ON THE PENIS.

(3) Prophylaxis after exposure. Actually this is EARLY TREATMENT. DO NOT ALLOW THE MEN TO FORGET THIS. TO BE OF VALUE IT MUST BE USED AS SOON AFTER EXPOSURE AS POSSIBLE.

a. The first step is urination. This has a flushing effect and tends to wash out any organisms which may have been deposited in the urethra. The bladder should be emptied spasmodically (in jerks) and the penis should be handled as little as possible.

b. The next step in chemical prophylaxis after exposure is the use of soap and water. Plenty of soap and water - that is as hot as can be comfortably tolerated-should be used in order to remove the gelatinous material containing the infectious

material. This procedure is particularly effective (only effective measure) against chancroidal infections which are so prevalent in this area (chancroid is a disease of filth). It is also helpful in preventing the other venereal diseases.

#### WASH THOROUGHLY

In addition to the penis (retract the foreskin), scrotum, abdomen, and inner parts of thighs; the hands, face, and lips should be thoroughly washed. It should be remembered that syphilis can be contracted on the lip by infected saliva and this washing is the only protective measure against infection on the lip. The mouth should be rinsed with some type of mouth-wash or gargle in that other types of infections such as trench mouth, epidemic sore throat, or tuberculosis may be prevented.

#### CHEMICAL PROPHYLAXIS

c. The next step is the injection of silver salt for the prevention of gonorrhea. At regular Army Pro Stations a solution of Protargol is used and in the V-Packette a silver picrate jelly is used. Those germicides are prepared in strength that will have a direct killing effect on the gonococci, and while they may produce slight burning and irritation they would not be effective in weaker solution. About a teaspoonful (4-6 cc; contents of yellow tube from V-Packette is injected into the urethra very gently and the end of the penis grasped and lightly clamped between the thumb and forefinger in order to retain the solution for five minutes. LESS THAN FIVE MINUTES IS NOT EFFECTIVE. The solution should be released and permitted to flow out slowly so that there will be no flushing effect and a certain amount of the solution will be left on the wall of the urethra. This will penetrate the upper layer of the mucousa and destroy any gonococci which may have made their way beneath the surface. The soldier should be instructed not to urinate for 4 or 5 hours so that the solution will not be washed out.

d. Thus far the use of soap and water, the chief protective measure against chancroid and to a considerable extent against the other venereal diseases, and the use of silver salt against gonorrhea has been explained. The next step is of great importance in that it offers protection against syphilis which is the more dangerous of the venereal diseases in that it requires longer treatment and carries much danger from its late complications. For this step Calomel Ointment is used. It should be rubbed gently but thoroughly into the penis (place a small amount

into the urethral opening; retract the foreskin; rub well into the head and shaft, paying particular attention to the corona - rim which surrounds the base of the glans penis; this is most frequent site of chancre - scrotum; lower part of the abdomen; and inner parts of thighs).

Eight to ten minutes should be devoted to thoroughly rubbing this ointment into the mucous membrane and skin as merely applying it to the surface is not sufficient. The spirochete may have penetrated the skin and it is necessary that the drug be given a chance to be effective.

The prophylactic procedures, as discussed, are used in regular Army Pro Stations and aid stations. The same principles hold true when the individual prophylactic package is used. These convenient packages (produced under various trade names such as V-Packettes) contain the same materials described above.

Encourage the men to accept a rubber and a V-Packette before leaving on pass and furlough if there is any chance at all that they might have a sexual exposure. If no exposure takes place (as indicated on the pass sheet) he should turn these articles in. Also encourage the men to go to the regular Army Pro Station when the station can be conveniently reached within one hour. If this cannot be done, the V-Packette should be used immediately after exposure (early bedside treatment) and when there is any doubt that the treatment has been thorough and complete he should then proceed to an Army Pro Station and be given a regular pro by a trained attendant. This applies particularly to men who were under the influence of alcohol.

The individual chemical prophylactic kits contain a sheet of paper on which complete directions are written. There is a piece of cloth impregnated with soap. Whenever additional soap is available it should be used to be certain that thorough washing occurs.

The excuses for failure to take a pro are ridiculous and are merely the reactions of an uninformed mind. Therefore it is our duty to see that these men understand the basic principles of the pro and that they are sold on the idea of using all protective measures available against venereal disease.

There remains one other method which should be regarded as a factor of safety. It cannot be used alone as it offers no protection against syphilis. This is the administration of sulfathiazole by mouth. It involves the use of a drug by mouth when it is too late to rely on the other type of chemical prophylaxis. No

one would ever deliberately omit the use of a condom, soap, and water or routine chemical prophylaxis with the intent to substitute the "pills" because the latter sometimes cause drug reactions and, even more important, the pills do NOT protect against syphilis. Even when the pills are to be used, very thorough washing with soap and water at the earliest possible moment after sexual intercourse is essential to prevent infection by washing the germs off before they get inside the skin or mucous membranes and produce disease.

TABLE 1.--Admissions for Venereal Disease, Total Army  
(Rates per 1,000 per year)

Year	All Venereal Diseases	Gonorrhea	Syphilis	Chancroid
1867	214.96	90.61	124.34	
1900	133.96	78.68	15.83	39.45
1915	99.33	58.18	19.73	21.42
1916	89.98	54.60	16.16	19.22
1917	107.23	77.92	15.18	14.13
1918	90.47	66.49	17.56	6.42
1925	52.25	31.08	11.70	9.46
1930	47.74	28.32	11.89	7.54
1935	35.14	22.25	7.82	5.07
1938	30.60	19.57	7.95	3.08
1939	29.61	20.19	6.59	2.82
1940	42.46	30.55	7.31	4.60

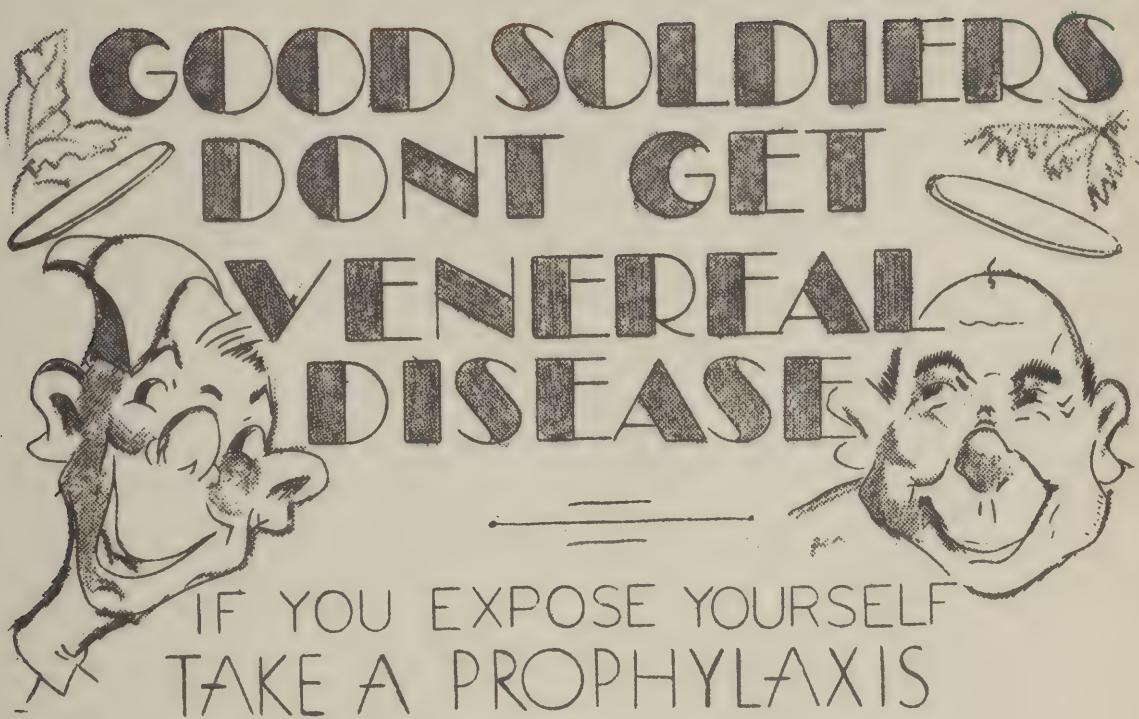
TABLE 2.--Admissions for Venereal Disease, Panama  
 (American Troops)  
 (Rates per 1,000 per year)

Year	All Venereal Diseases	Gonorrhea	Syphilis	Lymphogranuloma Chancroid	Inguinale
1929	70	26	14	30	
1931	100	37	12	51	
1932	77	44	11	22	
1933	68	41	8	19	
1934	72	38	12	22	
1935	80	38	11	31	
1936	64	31	8	25	
1937	63	32	9	20	2
1938	58	30	9	14	4
1939	50	27	8	12	3

TABLE 3.--Admissions for Venereal Disease, P.C.D., 1943  
 (Rates per 1,000 per year)

Month	P.C.D.	C.A.C.	Atl. Brig.	Pac. Brig.	1st C.A.	4th C.A.
January	69	59	52	62	55	96
February	50	54	39	61	77	47
March	51	57	52	61	8	104
April	51	57	40	73	41	59
May	60	59	50	65	34	64
June	44	35	43	29	39	24
July	42	34	32	34	20	52
August	33	24	17	22	25	48





1. Use a condom.
2. Urinate in spurts.
3. Use plenty soap and hot water.
4. Inject 4 - 6 cc of Protargol (or contents of tube in individual packette) into urethra and retain for five minutes, then allow contents to escape slowly.
5. Rub Calomel Ointment gently but thoroughly into the penis (place a small amount into the urethral opening); retract the foreskin; rub well into the head and shaft; scrotum; lower part of abdomen; and inner parts of the thigh. Eight to ten minutes should be devoted to thoroughly rubbing this ointment into the mucous membrane and skin.
6. Wrap penis in tissue paper.
7. Do not urinate after completion of Prophylaxis for four or five hours.
8. If length of time between exposure and Prophylaxis was two hours or more request that you be given a dose of Sulfathiazole.



## EXPOSURE HISTORY

Name of Female Partner:

**Address of Female Partner:**

**Description of Female Partner:**

(Fill out only if name and address of female partner unknown. Give height, color, weight, kind of hair, color of eyes, and any other peculiar marks.)

Condom used: Yes No

Individual Pro Packets Used: Yes No

Surname                    Christian Name                    Army Serial No.

**Rank**      **Company**      **Regt. or Staff Corps**

### **Time of exposure to a Venereal Disease:**

Hour.	Day	Month	Year
-------	-----	-------	------

Received prophylactic:

Hour	Day	Month	Year

Sulfathiazole Taken: \_\_\_\_\_ Yes \_\_\_\_\_ No \_\_\_\_\_

Protargol: \_\_\_\_\_ Yes \_\_\_\_\_ No \_\_\_\_\_

Calomel Ointment: \_\_\_\_\_ Yes \_\_\_\_\_ No \_\_\_\_\_

Complete Prophylaxis: \_\_\_\_\_ Yes \_\_\_\_\_ No \_\_\_\_\_

**Prophylactic Station Stamp**

(Signature of Attendant)



## CHAPTER 14

### Arthropod-Borne Infections

The following arthropod-borne infections were endemic in the Panama Canal Department during the World War II period, 1 January 1940 to 1 October 1945:

Malaria  
Relapsing Fever  
Typhus Fever  
Chagas' Disease

Dengue fever was clinically diagnosed on several occasions, but no serological studies or virus studies were done. One case of Q-fever was diagnosed and the diagnosis confirmed by isolation of the causative agent.

There were no cases of yellow fever among military or civilian personnel of this Department, although jungle yellow-fever is endemic in the Province of Darien, Republic of Panama.

No cases of sandfly fever were reported.

#### A. Malaria:-

Malaria is the most important arthropod-borne infection in this area. The most important vector is the A. albimanus which breeds in sun-lit collections of water varying from the small seepage collection of water in a cattle hoof print to large swampy areas. It is extremely doubtful that any of the other species of the Anopheles mosquito is a real vector in this area.

Anti-mosquito and malaria control campaigns and projects have been constantly carried on in the Panama Canal Zone since 1904 when Colonel, later Major General, William Crawford Gorgas, fresh from his remarkable success in ridding Havana of yellow fever and markedly reducing the annual rates for malaria was assigned to the Isthmian Canal Commission as Chief Sanitary Officer by President Theodore Roosevelt. Later Colonel Gorgas was made a member of the Commission in order that he might have a free hand in carrying out the necessary control work.

With the formation of the Panama Canal Department, the sanitation, anti-mosquito activities and malaria control activities passed the control of the Department and came under the direct supervision of the Department Surgeon.

From 1916 on, there have been two malaria control and anti-mosquito units functioning in this area; one the Sanitary Division of the office of the Chief Health Officer, the second the malaria control and anti-mosquito organization of the Office of the Department Surgeon.

A review of the statistical records shows that until 1944 the rate per thousand per annum for malaria among the troops of the Panama Canal Department was always at least twice that of the employees of the Panama Canal. This was believed due to the fact that the military personnel operating away from their home stations at least a part of every year were exposed to infection in areas of high endemicity.

There exists in the Republic of Panama and in the other Republics of Central and South America lying within the territorial limits of the Panama Canal Department a tremendous gametocyte-carrier population. Species of Anopheles known to be good vectors, especially Albimanus and Darlingi are found in all of these areas. The introduction of non-immunes who were forced to carry on military operations under the most primitive operations resulted in a high rate of infection.

The rates per thousand per annum for primary malaria, recurrent malaria, and combined (total malaria by calendar years for the Panama Canal Department for the period 1935 to 1945, inclusive, are set forth in Table 1.

TABLE 1.--Rates per Thousand per Annum, Primary Malaria, Recurrent Malaria and Combined Malaria, by Calendar Years, Panama Canal Department for the Period 1935 to 1945 inclusive.

Year	Primary Malaria	Recurrent Malaria	Combined Malaria
1935	36.1	7.5	43.6
1936	37.3	8.5	45.8
1937	36.6	8.1	44.7
1938	25.8	9.4	35.2
1939	20.7	0.7	21.4
1940	48.7	12.1	60.8
1941	40.7	11.1	51.8
1942	87.1	24.6	111.7
1943	24.9	21.7	46.6
1944	7.7	6.8	14.5
1945	5.8	3.4	9.2

The lowest rates per thousand per annum for primary malaria, recurrent malaria and for combined (total) malaria prior to the World War II period had been attained in calendar year 1939.

The Declaration of an Emergency made it necessary for troops of this Department to take the field during the rainy season of 1940. The result was an increase in the rate per thousand per annum for malaria. All precautions were taken in an attempt to prevent this increase. Quinine was used as a prophylactic drug. At first the routine 10 grains per day of quinine sulfate was administered. This was cordially hated by the troops, and was very difficult to enforce. It was decided to make an effort to provide quinine-free days in order to break the necessity of a daily dose every day for months when a unit was at position for such a period. The method of prophylaxis introduced in September 1940 was termed the short-course prophylaxis. Fifteen grains of quinine was administered daily for 5 days. This course was followed by a 7-day rest period and the course of quinine was then repeated. The results were little better than under the old method.

The need of a mosquito repellent was evident. Since no other repellent was available, the English Dover's cream containing oil of citronella, oil of cedar, hard parafine and soft parafine was used. This had practically no repellent-value when carefully controlled tests were run, but did give relief from the ever-present sandfly.

Protective clothing was used. Leggings, cotton gloves, and head nets were required to be used by all military personnel on duty outside of screened barracks between 1800 and 0630. The sleeves of the khaki shirts were required to be worn buttoned at the wrist. Bed nets were used in all except permanent barracks located in sanitized areas.

Pyrethrum was used as an anti-mosquito spray. All barracks, kitchens, mess-halls, recreation halls and moving picture theaters were sprayed between 0500 and 0530 and between 1800 and 1900 with concentrated pyrethrum in kerosene (concentrated, part, kerosene, 19 parts).

Special inspections of the screening, walls, eaves and roof-trees of all buildings occupied by troops at night were made. The system of mosquito-control orderlies whose duty it was to check screening walls, eaves, and roof-trees, and to make minor repairs was first instituted in this Department in the fall of 1940.

The Medical Department Field Sanitary Force was increased in size and the program of ditching, grading, oiling, and dusting with Paris Green greatly expanded. This was made necessary because of the tremendous building program which was initiated in the fiscal year 1941. Man-made breeding areas were constantly being made and, as in the days when Colonel Gorgas was attempting to sanitize a construction area, the constructing quartermaster and his contractors cut ditches and drains and blocked the flow of ditches, and streams with no thought of the mosquito breeding areas this created.

Construction increased in 1941. It became a battle to repair the harm caused by this construction. The Field Sanitary Force oiled all impounded water, but areas of new danger were created almost faster than they could be oiled.

The increase in the troop strength of the garrison resulted in the use of tents at many permanent stations as well as in the field. The tents were floored and screened. It was found practically impossible to mosquito-proof a pyramidal tent. The wind lifts the canvas off of the frame, and the quiet A. albimanus slowly but surely found each opening and gained entrance. Fortunately a large stock of concentrated pyrethrum in kerosene mixture was used quite lavishly. Because of the large droplet-size when used in hand knapsack sprayers, its use was uneconomical, but it did kill a high percentage of mosquitoes entrapped in a barracks or other buildings.

The program of keeping all buildings which were occupied by troops at night mosquito-proofed was continued during 1941. It was found necessary to double-floor an entire group of buildings built to house an infantry regiment in order to make the buildings mosquito-proof.

Experiments were conducted in the spraying of the uniforms of men on guard duty with the pyrethrum-kerosene mixture. Care was taken not to spray the face or other uncovered portions of the body. The spraying was repeated at two-hour intervals. The experimental subjects reported that this afforded relief from the bites of insects for about an hour. The bites of sandflies were reported to be greatly decreased. Organizations were permitted to adopt this method of protection if they so desired. The interiors of sentry hauts and road blocks were sprayed with pyrethrum and kerosene oil mixture three times nightly.

The use of this repellent was officially adopted in November 1942. The term "malaria discipline" was coined and used in this Department first in 1941. The term "caught-on" and was adopted by unit commanders who, through experience, had learned the value of control measures.

The attack of Pearl Harbor placed this Department on a war footing. All field positions were well trained in malaria control measures and knew the danger of exposure. However, guns and lights had to be manned at night and manned at the sound of the alarm. Protective measures and protective clothing were forced to give way to the military situation.

All newly arrived units were carefully indoctrinated in the dangers of malaria, the need for the institution of all malaria control measures, and anti-mosquito activities. These troops listened but did not act. They could not realize the deadly effectiveness of the A. albimanus. Unfortunately the new troops arrived early in the dry season and so did not see many mosquitoes, saw little or no casual water, and there was little or no malaria in the units during January, February and March. It was decided to test the plans for the defense of the Canal during April. The rains started about 10 days prior to the maneuvers. The problem was held under strict battle conditions in an area of high endemicity, in which albimanus was well-established and an area in which there was a very high gametocyte carrier rate. The rate of malaria started to rise following these maneuvers. Troops were sent to new positions unprovided with shelter of any type and were instructed to construct their own barracks. Construction activities created new breeding areas and expanded old ones. On the Atlantic side, a coral sand hydraulic fill blocked the tide water from entering the mangrove swamps. The heavy deposit of coral sand killed the mangroves, and the sun entered. This an A. aqua-salis breeding area became an albimanus breeding area and malaria on the Atlantic side greatly increased.

The rates per thousand per annum by months for primary, recurrent and combined (total) malaria, the Panama Canal Department for the calendar years 1941, 1942, and 1943 are shown in Table 2.

TABLE 2.--Rates per Thousand per Annum, by Months for Primary, Recurrent and Combined (Total) Malaria, Panama Canal Department, Calendar Years 1941, 1942 and 1943.

Month	Primary Malaria			Recurrent Malaria			Combined Malaria		
	1941	1942	1943	1941	1942	1943	1941	1942	1943
January	37.3	50.3	63.4	10.4	11.4	30.9	47.3	61.7	94.3
February	42.7	47.2	33.9	12.0	8.3	26.1	44.7	55.5	60.0
March	23.5	39.2	19.7	11.5	10.3	29.8	34.5	49.5	49.5
April	28.0	28.1	22.2	8.7	10.4	22.9	35.7	38.5	45.1
May	22.7	116.0	24.8	9.7	17.9	22.3	30.4	133.9	47.1
June	50.9	233.0	31.4	7.8	25.0	16.1	58.7	258.0	47.5
July	40.9	190.1	19.7	13.2	26.0	14.7	54.1	216.1	34.4
August	33.0	118.5	16.2	12.0	42.8	12.4	45.0	161.3	28.6
September	102.7	70.9	13.7	13.0	37.9	11.8	115.7	108.8	25.5
October	43.5	70.8	18.0	12.5	34.3	11.8	46.7	105.1	29.8
November	37.4	53.9	15.4	10.2	36.5	9.3	47.6	90.4	24.7
December	27.2	65.1	16.5	10.7	44.4	7.8	37.9	109.5	24.3

Lt. Colonel Paul F. Russell reported to The Surgeon General following an inspection tour of the Panama Canal Department in October 1942 that "In 1941 and 1942 large numbers of new troops entered the Panama sector, a factor which necessitated the construction of numerous new camps and barracks. This condition created a new malaria control problem because much of the new construction occurred in 'unsanitized areas.' This war-time expansion led to an increase in the malaria rate."<sup>4</sup>

Colonel Russell also stated in this report that "there is excellent malaria discipline in the Panama Canal Department" and that "it is also recognized that the chief source of malaria infection of soldiers in the Panama Canal Department is the untreated or poorly-treated civilian gametocyte carrier, living in areas where the chief vector, A. albimanus, is not adequately controlled."<sup>4</sup>

Following the April 1942 maneuvers, the combat teams assigned to the Department underwent a long period of intensified combat training under the most primitive environmental conditions in areas of high endemic malaria. The training included night attacks, night marches, and the establishment of overnight bivouacs. Adequate repellents were not available, and despite all teachings and warnings, the troops persisted in rolling up sleeves, opening collars at night and dispensing with head-nets in order to see better.

Troops at new Coast Artillery anti-aircraft positions were observed sleeping beside their guns, lights and radar apparatus rolled up in mosquito bars.

Night patrols, road blocks, guards, and sentries were maintained at all critical and important points, many of which were adjacent to areas in which former surveys had shown 100 percent infection in the native population.

Thousands of native laborers, not only from the Republic of Panama but also from the neighboring Republic of Central and South America and from the West Indies, were brought to the Department and lived adjacent to the troops.

The malaria control campaign was intensified. Slides setting forth the method of transmission of malaria, the life cycle of the mosquito, the methods of control of mosquito-breeding, the methods of protection against mosquitoes were shown at every motion-picture theater in the Department and at the 16 mm shows in the field. The fight against "Ann" and against "Miss Anopheles" was brought to every member of the military and civilian force here.

Late in 1942, the new repellents and the Freon-Aerosol bombs became available in small quantities to this Department. Atabrine was made available in sufficient quantities for issue to troops. The pyrethrum spray was continued in use.

A mimeograph letter, Subject: Control of Malaria in the Panama Sector, was published to the command on 19 January 1943. This became the "bible" of malaria control.

HEADQUARTERS PANAMA CANAL DEPARTMENT  
Office of The Department Commander

MIMEOGRAPH

LETTER NO. 3  
AG 710-3

Quarry Heights, Canal Zone  
19 January 1943.

Subject: Control of Malaria in the Panama Sector.

To: CGs, 6th AF, MF, CAC, SG, 6th AFSC;  
Division Engineer, Panama Division;  
COs, all "other units" of the Field Forces;  
COs, all units of the Service Command;  
COs, all posts, camps, stations and air bases.

1. Malaria is a debilitating and disabling disease transmitted by the bite of an infected Anopheles mosquito. This disease is very common in the Panama Sector and throughout the tropics.

2. Malaria in the Panama Sector can be controlled and held to a minimum by the constant and thorough application of the following malaria control measures:

a. Anti-mosquito sanitation, including:

- (1) Elimination of the breeding areas of the Anopheles mosquito or the rendering of such areas unfavorable to the development of the Anopheles mosquito.
- (2) The general use of mosquito proofing in all buildings in which men habitually live or work.
- (3) The use of bed nets at camps and positions in unsanitized areas.
- (4) The use of head nets, gloves and leggings between the hours of 1800 and 0630.
- (5) The liberal use of authorized repellents.
- (6) The use of a Pyrocide-20 or equal spray, or the freon-pyrethrum bomb in all barracks, kitchens, mess halls, recreation halls and latrines.
- (7) The use of Pyrocide-20 or equal spray, or the freon-pyrethrum bomb to spray tents and beds, bed nets used in tents.

b. The use of suppressive or prophylactic anti-malaria drugs.

c. Malaria discipline. This consists of the instruction and the exercise of the knowledge of the dangers of malaria, the methods of transmission, the methods of control and the coordinated application by all concerned by these measures.

3. Methods of application of anti-mosquito sanitation.

a. Elimination of mosquito breeding areas:

- (1) Each unit or organization will, within the limit of its capabilities, initiate prompt and effective measures for the elimination of all potential mosquito breeding areas in the unit or organization area by filling ruts and depressions which hold water, by grading and improving the drainage of such areas; by simple ditching; by cleaning drains and ditches, removing sediment or other obstructions, and by repairing or regrading earth ditches wherever found necessary. All containers capable of holding water shall be removed

and after flattening disposed of at the dump. Oil will be used in ant guards only or in areas where the unsatisfactory conditions cannot be corrected by filling, drainage, grading or ditching.

- (2) Under the direction of the commanding officer, each post, camp, or station engineer will initiate prompt and effective measures of the elimination of all potential mosquito breeding areas in the post, camp, or station area not assigned to units or organizations by filling ruts and depressions which hold water; by improving the grading or drainage of the areas; by ditching; by cleaning drains, ditches, road ditches, road culverts, removing sediment and other obstructions and by repairing or regrading earth ditches wherever necessary.
- (3) The field Sanitary Force, The Panama Sector under the direction of the Department Medical Inspector, will initiate prompt and effective measures for the elimination of all potential mosquito breeding areas present at military reservations outside of or contiguous to the post, camp, or station areas in which mosquito control is carried on by the post, camp, or station commander; will install and maintain sectional surface or sub-surface tile drains wherever required at posts, camps, and stations for the permanent elimination of mosquito breeding areas; will install and maintain all ditches in tidal flats or swamps; will conduct mosquito surveys, make collections of and identify mosquitoes and larvae found at posts, camps, and stations and in areas adjacent to military installations; will conduct such studies of the flight, breeding habits, day hibernation and other habits of the Anopheles and/or other disease transmitting mosquitoes as may be deemed necessary; will conduct studies on the value of mosquito repellents and anti-mosquito sprays; will assist in the collection of specimens for the determination of infected individuals and carriers; will maintain distribution points for anti-larval oil and other larvicides; will maintain such plants for the manufacture of pre-cast drainage tile as may be required and will make and maintain maps showing breeding areas or potential breeding areas and all drainage installations at posts, camps, or stations, The Panama Sector.

(4) The Department Medical Inspector, under the direction of the Surgeon, will make recommendations relative to control measures in connection with environmental factors of mosquitoes necessary for the protection of health. The execution of work on real property required to effectuate such control measures will be in accordance with these recommendations.

b. Inspections and upkeep of the mosquito proofing of barracks, kitchens, mess halls, recreation halls, latrines and other buildings regularly occupied by military personnel.

(1) The commanding officer of each company or detachment will assign an enlisted man, preferably a man with manual dexterity and mechanical ability, as mosquito proofing maintenance orderly in addition to his other duties. It will be the duty of this enlisted man to inspect daily the screening, side walls, eaves, and floor of each building occupied by the company or detachment for holes or tears in the screening and holes or cracks on the side walls, eaves or floor through which mosquitoes might enter. This orderly will also determine whether all doors close tightly. If holes or tears in the screening and holes or cracks in the side walls, eaves or floor are found in any building, immediate repairs will be made by this orderly within the limit of his capabilities. If the holes or tears in screening, or holes or cracks in the side walls, eaves or flooring are too large to be repaired by the orderly, he will notify the company commander or the first sergeant who will notify the post, camp, or station utilities of the number of the building and the nature of the repairs required.

(2) The post, camp, or station utilities will expedite the necessary repairs to all buildings which are reported in order to keep all buildings occupied by military personnel mosquito proof at all times.

c. The use of bed nets (mosquito bars).

(1) Bed nets (mosquito bars) will be used at camps, stations, and positions in unsanitary areas. Bed nets made of "buttercloth," "cheese cloth," "tobacco cloth," or similar material, impermeable

to circulation of air, should not be used, as nets of these materials are too closely woven to permit proper ventilation.

- d. The use of head nets, gloves and leggings between the hours of 1800 and 0630. In unsanitized areas head nets, gloves and leggings should be worn by all military personnel who are required to be outside of screened buildings between the hours of 1800 and 0630, provided that use of these articles will in no way interfere with the performance of the military duty, mission or activity.
- e. The use of authorized mosquito repellents. Liberal use will be made of the authorized mosquito repellents, i.e., indalone and 612. The repellent should be applied to the exposed surfaces of the body.
- f. The use of spray containing pyrethrum.
  - (1) Pyrethrum is a substance which when sprayed into the air in finely divided droplets is lethal to mosquitoes.
  - (2) Pyrethrum is available in concentrated extracts such as Pyrocide-20. It is also available in the form of a newly developed freon-pyrethrum bomb.
  - (a) All barracks, tents, kitchens, mess halls, recreation halls, theaters and latrines will be sprayed with either a 1 to 19 solution of concentrated pyrethrum in kerosene or by the use of freon-pyrethrum in bombs as follows:
    - 1. Sanitized Areas:
      - (aa) Barracks, tents, kitchens, mess halls and latrines will be sprayed each morning between 0500 and 0530 and each evening between 1800 and 1900.
      - (bb) Theaters and recreation halls will be sprayed daily at 0600 and 1800 or prior to the start of the first theater performance each evening.
    - 2. Unsanitized Areas:

- (aa) Barracks, kitchens, mess halls, latrines and occupied tents will be sprayed each morning between 0500 and 0530 and each evening between 1800 and 1900.
- (bb) Occupied tents will be sprayed each evening at 1800. Each mosquito bar, after being opened for use, will be sprayed between the hours of 2000 and 2300.
- (cc) Recreation rooms or halls and theaters will be sprayed each day at 0800 and prior to the first theater performance each evening.
- (dd) Huts at road blocks, sentry huts, huts used by beach patrols, anti-tank gun emplacements and pill boxes when occupied at night will be treated at 1800, 2300, and 0400. The uniforms of the men occupying such installations will be lightly sprayed with a 1 to 19 solution of concentrated pyrethrum in kerosene every two (2) hours, or by using the freon-pyrethrum bomb.

g. The use of suppressive or prophylactic anti-malaria drugs.

- (1) Suppressive or prophylactic drugs when required will be taken in accordance with paragraph 3, Circular Letter No. 135, Office of The Surgeon General, dated October 21, 1942, Subject: "The Treatment and Clinical Prophylaxis of Malaria."
- (2) Directive setting forth the period of the year and the areas in the Panama Sector in which the use of suppressive or prophylactic drugs is required will be published from time to time by this headquarters.

h. The exercise of anti-malaria sanitation at all construction projects.

- (1) All construction projects will be planned so that the man-made mosquito breeding areas incident to construction will be kept to a minimum.

- (2) All construction projects will include plans for final and definitive anti-malaria sanitation, the cost of which will be included in the project and which will be given the same priority and will be carried forward on the basis as the main project.
- (3) All casual water at construction projects will be eliminated at once by grading and ditching. If this is not feasible, the casual water will be treated by oiling or dusting every five days.
- (4) The Department Medical Inspector will be informed relative to all new construction projects and his recommendation relative to anti-malaria sanitation will be followed.

i. Malaria discipline.

- (1) This is the most important factor in the control of malaria. Only when each member of the command is thoroughly indoctrinated in the basic principles of the transmission of malaria, the disability caused by the disease and the methods of control, can coordinate application of the necessary control measures be successfully applied.
- (2) Instructions to new personnel arriving in the Department.
  - (a) General. As soon as practicable after the arrival of new personnel in this Department, such personnel will be instructed regarding the prevention of malaria and will be given specific information as follows:
    - 1. Malaria is very common in the tropics and especially in the Panama Sector. It occurs throughout the year. The high rate of infection and the very great amount of time lost by military personnel in this Sector has been largely caused by the failure to take the necessary precautions to prevent this disease. The infection rates for primary malaria are higher at positions which are close to native settlements and are higher at posts, camps, and stations which have large numbers of native laborers housed at the post, camp, or station. For example, malaria was practically non-existent on Taboga Island until a camp of native laborers from highly infected areas was established there.

2. The usual symptoms of the onset of this disease are chills, fever, headaches, muscular aching, prostration and sweats. Recovery is usual if prompt treatment is instituted, but the disease may be serious and long continued.
3. The disease is carried from person to person by certain mosquitoes belonging to the genus Anopheles which usually bite only between dusk and daylight, but if disturbed may bite at any time. Since an untrained person cannot tell which mosquitoes are dangerous, all of them should be religiously avoided.

(b) Sanitized and unsanitized areas. Malaria can be controlled by the strict observance of the following preventive measures which will be observed within the sanitized and unsanitized area by all military personnel from dusk to dawn:

1. In garrison, loitering or sitting in unscreened buildings or outdoors between the hours of 1800 and 0630 is prohibited.
2. Fishing from the banks of the Canal, the Miraflores, Madden or Gatun Lakes, the Gatun Spillway, the shores of Limon or Panama Bays, the Chagres River, the Coco Solo River or other streams or inlets between the hours of 1800 and 0630 is prohibited.
3. Swimming except in the established swimming pools at military posts or in the Canal Zone between the hours of 1800 and 0630 is prohibited.
4. All barracks, kitchens, mess halls, recreation rooms or halls, theaters, latrines and occupied tents will be regularly sprayed with anti-mosquito spray, using either a 1 to 19 solution of concentrated pyrethrum in kerosene or freon-pyrethrum bombs as follows:

(aa) Barracks, kitchens, mess halls, latrines and occupied tents will be sprayed each morning between 0500 and 0530 and each evening between 1800 and 1900.

(bb) Recreation rooms or halls and theaters will be sprayed each evening at 1800.

5. All doors will open outward and will be so adjusted so as to close tightly when not in use. Holes and tears in screening, cracks, knot holes or other openings in the walls, floors, eaves, roofs, door frames or window frames will be immediately repaired.
6. All fire buckets containing water will be emptied once each month, thoroughly cleaned, refilled and 4 cc. (one tea-spoonful) of crude creosote added in order to prevent mosquito breeding.
7. At each monthly physical inspection the post or unit surgeon or his commissioned representative will give instructions to each group being inspected relative to the prevention of malaria.
8. Responsible officers will give constant attention to the elimination of all possible breeding spots for mosquitoes in areas assigned to and contiguous to their command. In this respect each hole or depression in the ground in which water may accumulate will be filled, graded or drained and all drains and ditches will be cleaned and freed from obstructions. Casual water which cannot be eliminated by filling, grading or ditching will be sprayed with oil or dusted with larvicide every fourth day.

(c) Unsanitized areas.

1. The following additional preventive measures will be observed by all military personnel on duty at or visiting unsanitized areas in the Canal Zone, the Republic of Panama or elsewhere in the Panama Sector where malaria is endemic:

(aa) Suppressive or prophylactic anti-malaria drugs will be taken as prescribed in paragraph 3 g (1) and (2) supra.

- (bb) Protective clothing will be worn from 1800 to 0630 while outside of screened barracks, screened buildings or screened tents.
- (cc) Loitering or sitting outdoors, loitering along trails or roads, or sitting in parked vehicles along trails or roads without protective clothing, head nets and gloves is prohibited.
- (dd) Bed nets (mosquito bars) will be used at all times.
- (ee) Whenever personnel are engaged on military duties where gloves and head nets are not worn, liberal use of repellent solutions, i.e., indalone or 612 will be made.
- (ff) The clothing of all personnel on guard duty or who are engaged in military duties outside of screened buildings will be lightly sprayed every two hours with a 1 to 19 solution of concentrated pyrethrum in kerosene or by using the freon-pyrethrum bomb.

j. Inspections and Reports.

- (1) Post, camp, stations, unit or organization surgeons or their commissioned assistants will make frequent inspections of their respective areas with reference to anti-malaria sanitation and will make recommendations to their respective commanding officers relative to sanitary defects and measures to be used to correct defects.
- (2) Each post, camp, station, unit or organization surgeons will include a statement relative to measures used in the control of malaria in the monthly sanitary report under paragraph (2), Environmental Sanitation.
- (3) The Department Medical Inspector or his commissioned assistants will make such inspections of posts, camps, stations and positions in this area as may be required to coordinate the activities relative to anti-malaria sanitation and to keep himself informed relative to conditions which may effect the incidence of malaria.

BY COMMAND OF LIEUTENANT GENERAL BRETT:

s/G. S. ARMES,  
Colonel, Adjutant General's Department  
Adjutant General.

Adequate quantities of repellent and Freon-Aersol dispensers were received in this Department in April 1943. The command was informed of the availability of these on April 8, 1943 and the methods of use were carefully described in a letter circulated to the command on 18 April 1943. These instructions are reproduced below:

HEADQUARTERS PANAMA CANAL DEPARTMENT  
Office of The Department Commander

CIRCULAR)  
NO. 29)

Quarry Heights, C. Z.  
8 April 1943

\* \* \*

5. INSECTICIDES AND INSECT REPELLENTS. - a. Organization commanders can obtain by requisition to their Post Quartermaster insect repellent, 2-oz. bottles; insecticide Freon-Aerosol, 1-lb. dispensers; and pyrocide for insect control.

b. The following basis of issue will be used in the preparation of requisitions:

- (1) Insect repellent, 2-oz. bottle. Initial issue, one bottle per man. Replacement issue, for tactical organizations and service units as required, and for administrative organizations on recommendation of Surgeon.
- (2) Insecticide Freon-Aerosol, 1-lb. dispenser. Initial issue, one bottle for replacements, issue on basis of 15 one-pound dispensers per 100 men per month.
- (3) Pyrocide insecticide. Initial and replacement issue. 1 1/2-gal. per 100 men per quarterly period. (This is to be mixed with 19 parts kerosene to obtain finished spray). (Misc. Div.) (AG 729.5-1).

\* \* \*

BY COMMAND OF LIEUTENANT GENERAL BRETT:

s/HUGH F. DEENEY,  
Colonel, Adjutant General's Department,  
Adjutant General.

HEADQUARTERS PANAMA CANAL DEPARTMENT  
Office of The Department Commander

MIMEOGRAPH

LETTER NO. 29  
AG 729.5-1

Quarry Heights, C.Z.  
18 April 1943

SUBJECT: Control of Malaria.

To: CGs, A Comd, CAC, MF, SC;  
COs, all "other units" of the Field Forces;  
COs, all units of the Service Command;  
COs, all posts, camps and air bases.

Reference War Department letter AG 729.5 (3-20-43)  
OB-S-SPCCQ-M, dated March 22, 1943, subject "Distribution of Insecticide and Pest Control Equipment," the freon-aerosol, 1-lb. dispensers of insecticide and the 2-ounce bottles of repellent, insect, are now available for issue by the post quartermasters.

a. The freon-aerosol, 1-lb. dispensers stock number 51-1-159 will be issued in the future in lieu of insecticide liquid, i.e., pyrocide-20 or equal, on the basis of 150 dispensers per 1000 men per month, 15 dispensers per 100 men per month, or pro rata portion thereof.

- (1) The dispensers contain pyrocide suspended in oil of sesame. In a separate chamber there is liquid freon which is compressed to 70 pounds pressure. When the cap is removed from the dispenser the freon volatilizes and escapes as a gas, carrying with it the finely divided droplets of pyrocide and oil of sesame. These finely divided droplets are lethal to mosquitoes and other insects.
- (2) Each freon-aerosol, 1-lb. dispenser contains sufficient insecticide to properly spray 150,000 cubic feet of air space. This dispenser should be used in the spraying of the barracks, mess halls, recreation rooms, kitchens, latrines, etc., and will also be used in lieu of the pyrocide-20-kerosene spray in the spraying of uniforms of men who are on guard duty or other duty which requires them to be outside of mosquito proof buildings between the hours of 1800 and 0630, and to spray huts and road blocks, sentry huts, huts used by beach patrols, anti-tank gun emplacements and pill boxes in accordance with paragraph 3f. Mimeograph Letter No. 3, AF 710-3 this headquarters, dated 19 January 1943, subject: "Control of Malaria in the Panama Sector."

- (3) The directions on the freon-pyrethrum bombs should be carefully read prior to using and care should be taken not to waste this material since the allowance is limited. Instructions and demonstrations in the proper use of the freon-aerosol 1-lb. dispensers should be conducted by each post and unit surgeon.
- b. The 2-ounce bottle of repellent, insect, will be issued at the ratio of one 2-ounce bottle per man per month.
  - (1) The repellent is dispensed in a 2-ounce bottle provided with a cork which has a fenestration which is covered with a metal screw cap top. In order to use the repellent the screw top is removed, the bottle inverted and the fenestrated cork opening is rubbed lightly over the area which is desired to cover with the repellent. The repellent is then evenly spread by lightly rubbing the area with the palm of the hand.
  - (2) The repellent is effective for approximately two hours when the individual is not perspiring. When the skin is covered with perspiration the effective time of the repellent is reduced to a period of approximately 45 minutes. Therefore, when the skin is covered with perspiration and there is exposure to the bites of mosquitoes and other insects, it is necessary to repeat the use of the repellent approximately every 45 minutes. When the skin is dry, or when there is the usual slight moisture which is common on the skin in the tropics, the use of the repellent should be repeated approximately every two hours. The skin should be lightly covered with the repellent since heavy coverage is no more effective.
  - (3) Post or unit surgeons should demonstrate the use of this repellent to all military personnel and should personally see that the proper method of use is made of the repellent and the container.

BY COMMAND OF LIEUTENANT GENERAL BRETT:

s/HUGH J. DEENEY  
Colonel, Adjutant General's Department  
Adjutant General

Troops in unsanitary areas were placed on repressive atabrine (prophylactic) in November 1942. In order to obtain information relative to reactions to the suppressive use of this drug questionnaires were prepared for use in all cases developing a reaction and the necessity of taking the suppressive dose of atabrine only after meals was stressed. There were few reactions once proper methods of administration only after meals was established. The questionnaire used is reproduced here:

(Unit or Organization) (Name of Med Off Completing Question)

QUESTIONNAIRE - ATABRINE PROPHYLAXIS  
PANAMA SECTOR

1. Name: \_\_\_\_\_ 2. ASN: \_\_\_\_\_
3. Rank: \_\_\_\_\_ 4. Organization: \_\_\_\_\_
5. APO: \_\_\_\_\_
6. Atabrine prophylaxis started: \_\_\_\_\_
7. Month: \_\_\_\_\_ 8. Day: \_\_\_\_\_
9. Day of week on which atabrine taken: \_\_\_\_\_
10. Number of atabrine tablets taken each day: \_\_\_\_\_
11. Were atabrine tablets taken each day: \_\_\_\_\_
12. Name of manufacturer of atabrine taken: \_\_\_\_\_
13. Lot number: \_\_\_\_\_
14. Date of onset of diarrhea: \_\_\_\_\_
15. Type of stool: \_\_\_\_\_
16. Frequency of the bowel movements per day: \_\_\_\_\_
17. Were any of the following symptoms noted:  
(a) Nausea \_\_\_\_\_ (d) Headache \_\_\_\_\_  
(b) Vomiting \_\_\_\_\_ (e) Fever \_\_\_\_\_  
(c) Pain in stomach \_\_\_\_\_ (f) Excessive sweating \_\_\_\_\_
18. Was treatment in quarters required: \_\_\_\_\_
19. Was hospitalization required: \_\_\_\_\_
20. Remarks: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

NOTE: Questionnaire will be filled out by a medical officer in cases of all men developing reactions to atabrine prophylaxis.

All questions will be completely filled out. Definite answers will be recorded. Do not use a cross or a check mark for an answer. Record answer as given. Do not ask leading questions. Questionnaires will be completed and returned to this office without delay. Use typewriter wherever possible.

The use of atabrine prophylaxis was limited to troops in the field stationed in highly endemic areas. The use of this drug was discontinued during the dry season of 1943. It was reinstated in areas of high endemicity with the advent of the wet season.

The follow-up treatment of cases of vivax malaria was instituted in November 1943.

The various directives relative to the control of mosquito breeding in use in this Department were published as a Department Memorandum on 4 January 1943:

Mimeograph Letter No. 97 was the last of the series of 1942.

HEADQUARTERS PANAMA CANAL DEPARTMENT  
Office of The Department Commander

MIMEOGRAPH

LETTER NO. 1

AG 710-3

Quarry Heights, C.Z.

4 January 1943

SUBJECT: Control of Mosquito Breeding.

To: CGs, AC, CAC, SC, (including all regiments separate battalions, separate companies and similar units); COs, all "other units" of the Field Forces; COs, all units of the Service Command; COs, all posts, camps and stations.

1. Control of Mosquito Breeding. - a. Activities associated with construction and other phases of the war effort have resulted in the creation of large numbers of breeding places for both disease bearing and pest mosquitoes. The Anopheles albimanus mosquito, principal transmitter of malaria in this

area, breeds readily in small discarded cans, bodies of water, ie., the so-called casual water in road ruts, blocked ditches, clogged tile drains and water impounded because of construction activities.

b. The elimination of all small bodies of standing water in and about posts, camps, stations and positions will result in a reduction of Anopheles breeding and a reduction in the rate of primary malaria among the military and civilian personnel.

c. It is directed that the following types of casual water be eliminated without delay by filling, grading, ditching and cleaning of ditches and tile drains.

- (1) Tire ruts in temporary, semi-permanent and permanent motor standing areas.
- (2) Puddles and pools resulting from heavy run-off from roofs.
- (3) Tire ruts and depressions in road shoulders.
- (4) Impounded water resulting from broken down road shoulders and blocked road ditches.
- (5) Impounded water resulting from blocked inverted tile ditches or other type of blocked drainage ditches.
- (6) Impounded water resulting from blocked culverts.
- (7) Impounded water at construction projects resulting from unfilled barrow pits, incomplete grading, tractor and bulldozer tracks, ruts caused by heavy trucks and blockage of natural lines of drainage.
- (8) Impounded water resulting from poorly drained roads and from temporary roads which have not been graded or ditched.

d. The attention of all responsible officers is called to the provisions of paragraph 56 e (7) Panama Canal Department Regulations. (Instructions on prevention of malaria).

e. In order to obtain proper drainage and to eliminate mosquito breeding areas, all culverts will be placed so as to provide for minimum flow at all times. Culverts are usually installed so as to equalize the level of the water on each side of the culvert. This method does not permit the complete drainage of the impounded water.

f. All construction and other material will be stored in such a manner that water cannot accumulate under stock piles or in depressions in the stock piles or the material forming the stock piles.

2. Inspection and Reports. Post, camp, and station surgeons or their medical inspectors will make periodical inspections for the purpose of determining the presence of impounded water resulting from improperly placed culverts, the blockage of streams, seepage water and other water drainage by fills, temporary roads, or other construction projects and from improperly graded and drained fills. On the last day of each month the Commanding Officer of the post, camp or station will submit a report to this headquarters showing the following information:

- a. The location or nature of all impounded water found, as a result of inspections by the Surgeon or his representatives.
- b. Proposed plan for remedying unsatisfactory conditions found.
- c. Are necessary materials and facilities available to complete work on the unsatisfactory conditions?
- d. Comment and recommendation of the commanding officer.

BY COMMAND OF LIEUTENANT GENERAL BRETT:

s/G. S. ARMES  
Colonel, Adjutant General's Department  
Adjutant General

A monthly report relative to impounded water and the plans for the remedying of any unsatisfactory conditions found was required to be rendered by the surgeon of each post, camp or station and to contain the comments and recommendations of the respective commanding officers. In April 1943, a follow-up memorandum on the subject of Control of Mosquito Breeding was published by the Department:

HEADQUARTERS PANAMA CANAL DEPARTMENT  
Office of The Department Commander

726. (Surg)

Quarry Heights, C.Z.  
1 April 1943

SUBJECT: Control of Mosquito Breeding

To: CG, A Comd;  
COs all Air Bases, XAD's;  
COs all units of the A Comd.

1. Mimeograph Letter No. 1, this headquarters, 4 January 1943, subject same as above, file AF 710-3, is quoted for compliance:

"1. Control of mosquito breeding. a. Activities associated with construction and other phases of the war effort have resulted in the creation of large numbers of breeding places for both disease bearing and pest mosquitoes. The Anopheles albimanus mosquito, principal transmitter of malaria in this area, breeds readily in small bodies of standing water, i.e., the so-called casual water in road ruts, depressions, discarded cans, blocked road ditches, clogged tile drains and water impounded because of construction activities.

b. The elimination of all small bodies of standing water in and about posts, camps, stations and positions will result in a reduction of Anopheles breeding and a reduction in the rate of primary malaria among the military and civilian personnel.

c. The attention of all responsible officers is called to the provisions of paragraph 56 e (7) Panama Canal Regulations. (Instructions on prevention of malaria).

d. It is directed that the following types of casual water be eliminated without delay by filling, grading, ditching and cleaning of ditches and tile drains:

- (1) Tire ruts in temporary, semi-permanent and permanent motor standing areas.
- (2) Puddles and pools resulting from heavy run-off from roofs.
- (3) Tire ruts and depressions in road shoulders.
- (4) Impounded water resulting from broken down road shoulders and blocked road ditches.

- (5) Impounded water resulting from blocked inverted tile ditches or other type of blocked drainage ditches.
- (6) Impounded water resulting from blocked culverts.
- (7) Impounded water at construction projects resulting from unfilled borrow pits, incompletely grading, tractor and bulldozer tracks, ruts caused by heavy trucks and blockage of natural lines of drainage.
- (8) Impounded water resulting from poorly drained roads and from temporary roads which have not been graded or ditched.

e. In order to obtain proper drainage and to eliminate mosquito breeding areas, all culverts will be placed so as to equalize the level of the water on each side of the culvert. This method does not permit the complete drainage of the impounded water.

f. All construction and other material will be stored in such a manner that water cannot accumulate under stock piles or in depressions in the stock piles or the material forming the stock piles.

"2. Inspection and Reports. Post, camp, and stations or their medical inspectors will make periodical inspections for the purpose of determining the presence of impounded water resulting from improperly placed culverts, the blockage of streams, seepage water and other water drainage by fills, temporary roads, or other construction projects and from improperly graded and drained fills. On the last day of each month the Commanding Officer of the post, camp, or station will submit a report to this headquarters showing the following information:

a. The location and nature of all impounded water found, as a result of inspections by the surgeon or his representatives.

b. Proposed plan for remedying unsatisfactory conditions found.

c. Are necessary materials and facilities available to complete work on the unsatisfactory conditions?

d. Comment and recommendation of the commanding officer.

"3. Reference paragraph 1 c of the above quoted letter, paragraph 56 e (7) Panama Canal Department Regulations referred to therein, was superseded by Mimeograph Letter No. 3, AG 710-3, this headquarters, 1 January 1943, subject: Control of Malaria in the Panama Sector.

BY COMMAND OF LIEUTENANT GENERAL BRETT:

s/HUGH J. DEENEY  
Colonel, Adjutant General's Department  
Adjutant General

A follow-up Mimeograph Letter No. 3, Panama Canal Department, 19 January 1943 was published 30 April 1943:

HEADQUARTERS PANAMA CANAL DEPARTMENT  
Office of The Department Commander

CIRCULAR)  
NO. 36)

Quarry Heights, Canal Zone  
30 April 1943

E X T R A C T

\* \* \* \* \*

2. Malaria Control. - a. During recent inspections it has been observed that in many instances the provisions of Mimeograph Letter No. 3, this headquarters, dated 19 January 1943, are not being complied with. The following irregularities have been commonly observed:

- (1) Lack of or improper use of the pyrethrum insecticide spray in barracks, tents, kitchens, mess halls, latrines, theaters and recreation rooms.
- (2) Doors of sentry huts propped open at night.
- (3) Lack of the use of pyrethrum insecticide spray at sentry huts, beach patrol huts, anti-tank gun emplacements and pill boxes.
- (4) Lack of use of head nets, gloves and leggings by sentries between the hours of 1800 and 0630.
- (5) Failure of units or organizations to initiate prompt and effective measures for the elimination

of all potential mosquito breeding areas in the unit or organization area.

(6) Failure of company or detachment commanders to assign an enlisted man as mosquito proofing maintenance orderly.

b. The malaria rate has shown an increase with the advent of the wet season. Strict observance of all malaria control measures is essential in order that the rate of malaria, a preventable disease, may be kept within the lowest possible limits in this command. (Misc. Div.) (AG 710-3) (D Surg).

\* \* \* \* \*

BY COMMAND OF LIEUTENANT GENERAL BRETT:

HUGH J. DEENEY  
Colonel, Adjutant General's Department  
Adjutant General

In order to make a complete epidemiological study of each case of malaria developing in this Department, a Malaria Infection Questionnaire was developed in the spring of 1943:

Hospital

APO NO. \_\_\_\_\_ (Date) \_\_\_\_\_

MALARIA INFECTION QUESTIONNAIRE

1. (a) Name of patient \_\_\_\_\_ (b) State in which lived prior to entry into service \_\_\_\_\_  
(c) Home state \_\_\_\_\_
2. Grade \_\_\_\_\_
3. Organization \_\_\_\_\_
4. Stationed at \_\_\_\_\_  
(Give APO No. of post, camp or station or number and type of position at which stationed.)
5. Post, camp, station or position in: (a) Sanitized area \_\_\_\_\_  
(b) Unsanitized area \_\_\_\_\_
6. (a) Type of malaria \_\_\_\_\_ (b) Primary \_\_\_\_\_  
(c) Recurrent \_\_\_\_\_

7. (a) Did you ever have malaria before? \_\_\_\_\_ (b) Date of each previous attack \_\_\_\_\_  
(c) Was diagnosis made by blood smear? \_\_\_\_\_  
(d) Type if known \_\_\_\_\_

8. Date of onset of symptoms, present attack \_\_\_\_\_

9. Date of admission to hospital \_\_\_\_\_

10. Date of diagnosis \_\_\_\_\_

11. Length of time at present station \_\_\_\_\_

12. Length of time in Panama Canal Department \_\_\_\_\_

13. (a) Were you on pass during the past 30 days? \_\_\_\_\_  
(b) Did you visit native villages? \_\_\_\_\_  
(c) Native homes? \_\_\_\_\_ (d) Go fishing? \_\_\_\_\_  
(e) Hunting? \_\_\_\_\_ (f) Visit unsanitized areas at night? \_\_\_\_\_

14. Quartered in: (a) Permanent barracks \_\_\_\_\_ (b) Temporary barracks \_\_\_\_\_ (c) Hutment \_\_\_\_\_ (d) Tent \_\_\_\_\_

15. Sleep under mosquito bar: Yes \_\_\_\_\_ No \_\_\_\_\_

16. (a) How many times is barracks, hutment or tent sprayed with anti-mosquito spray each day? \_\_\_\_\_ (b) At what hours is spraying performed? \_\_\_\_\_

17. Is a hand spray or an aerosol bomb used? \_\_\_\_\_

18. Do you have a bottle of the issue mosquito repellent? \_\_\_\_\_

19. (a) How often do you use it? \_\_\_\_\_ (b) Do you consider that the repellent prevents mosquito bites? \_\_\_\_\_

20. (a) Is your uniform sprayed before going on sentry duty? \_\_\_\_\_  
Guard duty? \_\_\_\_\_ Watchman duty? \_\_\_\_\_  
(b) How often is the spray repeated? \_\_\_\_\_  
(c) Do you consider that spraying the uniform protects you from mosquito and other insect bites? \_\_\_\_\_  
(d) For how long? \_\_\_\_\_

21. When on guard duty do you wear a headnet? \_\_\_\_\_  
Gloves? \_\_\_\_\_ Leggings? \_\_\_\_\_

22. (a) Are the sentry huts, road block huts, control rooms, anti-tank gun emplacements, machine gun emplacements sprayed each night with anti-mosquito spray? \_\_\_\_\_  
How often is spraying performed each night? \_\_\_\_\_

23. Are your sleeping quarters mosquito tight? \_\_\_\_\_

24. Have you had instruction in:  
(a) How to avoid being bitten by mosquitoes? \_\_\_\_\_  
(b) How malaria is spread? \_\_\_\_\_  
(c) How to avoid being infected with malaria? \_\_\_\_\_

25. (a) Have you been taking atabrine? \_\_\_\_\_  
(b) If you have, for how long? \_\_\_\_\_  
(c) How many pills are given to you each week? \_\_\_\_\_

26. Remarks:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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(Name)

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(Rank)

Original to be forwarded to the Department Surgeon. Copy to be forwarded to organization of the patient.

This questionnaire was filled in as soon as a case of malaria was diagnosed and the patient was well enough to be questioned. The assistant malaria control officer made follow-up inspections and took action to initiate correction of any defects in malaria control found.

At the change of seasons, all commanding officers were notified of the dangers due to the increased activities of the Anopheles and directed to take necessary action to check mosquito control measures. These directives were published twice each year. A type directive is shown below:

HEADQUARTERS PANAMA CANAL DEPARTMENT  
Office of The Department Commander

CIRCULAR)  
NO. 94)

Quarry Heights, Canal Zone  
4 December 1943

E X T R A C T

2. MALARIA PREVENTION AND CONTROL. a. With the approach of the Dry Season, the number of Anopheles mosquitoes increased greatly due to the clarification of pools of water and increased biological activity of these insects. An intensified program of malaria discipline and control is necessary if a sharp rise in the rate of primary malaria among military personnel of this Department is to be avoided.

b. Responsible commanders will therefore take steps to assure that the screening and mosquito-proofing of all buildings are checked daily, that all casual water in the vicinity of barracks, mess halls, recreation halls, and other buildings are

oiled not less than once a week, and that all military personnel be impressed with the need to employ all protective measures, including the use of protective clothing and the application of skin repellents, in accordance with the provisions of Mimeograph Letter No. 3, this headquarters, dated 19 January 1943, and current directives. (Misc. Div.) (AG 710-3).

A Department Malaria Control officer was appointed in February 1943. The Department Medical Inspector who had previously acted as Malaria Control officer was designated to fill this position in addition to his other duties.

A Sanitary Engineer and an Assistant Malaria Control officer were assigned to the Department in June 1943.

A long range study of the requirements for definitive mosquito control was instituted in 1943. The Department Malaria Control officer and the Department Sanitary Engineer officer and two survey units mapped the military installations within the Panama Canal Zone.

All areas territorially in the Panama Canal Zone adjacent to military installations, or intervening between military installations, were studied. Plans were developed for control of impounded water, stream control, and terrain drainage. The work required was listed under the categories (a) Projects considered immediately necessary; (b) Projects considered as requiring development in the near future, i.e., within 1 to 3 years; and (c) Long range projects requiring completion within 5 to 10 years.

All projects in Panama Canal Zone territory were referred to the Chief Health Officer, the Panama Canal for approval. Approved projects in Panama Canal Zone territory were to be developed by the Department Engineer or, if so desired, by the Chief Health officer of the Sanitary Division, The Panama Canal, under an allocation of funds by the Department Engineer.

The completed projects were approved by the Department Engineer and the Commanding General. Work projects with value of \$400,000 for labor and material were set up for the Fiscal Years 1945 and 1946. Copy of the Long Range Malaria Control Program, The Panama Canal Department, is attached hereto as Exhibit A. The projects for the Fiscal Years 1945 and 1946 are attached as Exhibits B and C respectively.

Thus for the first time since the institution of the Panama Canal Department, a definitive program for Malaria Control (Control of casual water, stream training and terrain drainage) has been placed in effect.

The Medical Department Field Sanitary Force will still continue to carry on the maintenance of ditches, streams, and other waters, will continue to install drains and ditches in cooperation with the Department Engineer, will trap adult mosquitoes, hunt larval, oil casual water and carry on other insect and rodent control measures.

As set forth in Table II, there was a distinct decrease in the rate for primary malaria and total malaria during 1943. The housing situation improved during this year, troops were all in mosquito-proof barracks or hutments by August 1943. Building programs had become stabilized and large areas of casual water were eliminated. The effectiveness of the mosquito repellents, the freon-aerosol dispensers, the pyrethrum sprays, use of bed-nets, protective clothing and the mosquito-proofing of all buildings occupied at night were amply proven.

The rates per thousand per annum for primary malaria, recurrent malaria and combined (total) malaria by months, the Panama Canal Department for the calender years 1944 and 1945 are set forth in Table III:

TABLE 3.--Rates per Thousand per Annum, Primary Malaria, Recurrent Malaria, Combined (Total) Malaria, by Months, Panama Canal Department for the Calendar Years 1944 and 1945.

Month	Primary Malaria		Recurrent Malaria		Combined Malaria	
	1944	1945	1944	1945	1944	1945
January	10.0	4.0	12.5	5.9	22.6	9.9
February	8.5	2.1	10.9	4.1	19.4	6.2
March	3.4	2.9	4.9	7.2	8.3	10.1
April	1.6	3.9	4.6	4.7	6.2	8.6
May	10.8	9.6	5.1	4.8	15.9	14.4
June	14.0	8.4	9.8	1.2	23.8	9.6
July	18.0	5.3	5.4	3.5	23.4	8.3
August	8.5	5.4	6.3	0.9	14.8	6.3
September	7.2	8.2	4.8	1.2	12.0	9.3
October	4.4	5.6	6.8	1.3	11.2	6.9
November	5.0	6.5	5.3	2.2	10.3	8.7
December	2.3	11.9	5.3	3.5	6.6	15.5

These rates reflect the success of the malaria control measures. In 1945, for the first time in the history of the Panama Canal Department, the rate of combined (total) malaria was lower than the rate for The Panama Canal for the employees of that facility.

Late in 1943, a supply of DDT was furnished this Department and tests of the efficiency of this new larvicide were conducted. Two reports were made to The Surgeon General, U. S. Army.<sup>5</sup>

A third report on the Observations and Comments on the Efficacy of a New Larvicide and Some Methods of Application was completed in May 1944. Copy of this report is attached as Exhibit D.

A board of officers was appointed by the Commanding General, Panama Canal Department, (Par. 19, S.O. No. 76, Hqs. Panama Canal Department, 24 March 1944) for the purpose of conducting certain tests relative to malaria control.

This board conducted tests to determine the efficacy of solutions of DDT in oil as an adulticide and larvicide in equipped aircraft. Three reports were rendered:

(a) Report of first phase of the investigation entitled "Airplane Application of DDT," rendered 22 May 1944.

(b) Second report entitled "Airplane Application of DDT for the Destruction of Adult Mosquitoes," rendered 20 July 1944.

(c) Third report entitled "Airplane Application of DDT for the Destruction of Adult Mosquitoes," rendered 20 July 1944.

A board of officers was appointed by the Commanding General, Panama Canal Department (Letter, Hq. Panama Canal Department, 2 December 1944) for the purpose of studying certain aspects of malaria control. This board assisted a U. S. Navy board in conducting tests to determine the efficacy of a twenty percent (20%) solution of DDT by weight in "Velsicol NR 70" distributed as an aerosol spray by a specially equipped combat aircraft (Navy). Report was rendered by the board on 16 March 1945. Copy of officers appointed to study certain aspects of Malaria Control, Panama Canal Department 1944. The Navy Board Report, Project No. TED No. PTR 32175, dated 29 January 1945 entitled "Final Report on Development and Test of Airplane Dispersal of DDT aerosol," was rendered on 29 January 1945. A copy of this report was sent to The Surgeon General.

A board of officers was appointed by the Commanding General, Panama Canal Department (Letter, Hq. P.C.D., file AG 710-3, dated 23 January 1945, Subject: Appointment of Board of Officers to Study

Certain Aspects of Malaria Control) to assist the Army Air Force Board in Army Air Forces Board Project No. F-4095. Phase III of this project involved "studies to determine the effectiveness of simplified special apparatus for spraying DDT from airplanes for the destruction of adult mosquitoes and larvae, employing Army Air Forces equipment." Large pay load type aircraft were used and various formulae of DDT and solvents were tested. Six similar jungle test plots, two native village test plots and a lake and jungle area were used. The report of results were included in "Report of the Army Air Forces Board, Project No. 4095 BC-725, dated 11 April 1945." Forty copies were furnished The Surgeon General.

The results of the experimental studies on the effectiveness of DDT in the temporary reduction of adult mosquitoes and mosquito larvae. When solutions were distributed from a specially equipped plane, mechanically operated spray pumps, hand pumps or by painting walls and screens with a brush, resulted in the appointment of a permanent board for the purpose of studying certain aspects of malaria control by the Department Commander, Panama Canal Department, 17 March 1945, (Letter, Hq. P.C.D., file AG 710-3, dated 17 March 1945, Subject: Appointment of Board of Officers to Study Certain Aspects of Malaria Control).

The specially equipped C-47 plane used in the Army Air Forces Board tests was assigned to the Sixth Air Force. Numerous tests were conducted to determine the value of solutions of DDT in the destruction of adult mosquitoes and larvae. The following areas were used as test areas:

- (a) The Chilibre-Buenos Aires area, in which two native villages were located.
- (b) The Gatun River area, a river, lake and jungle area.
- (c) The Far-Fan swamp area.
- (e) The old French Canal area.

An interim report entitled "The Use of Airplanes for Mosquito Control Operations and Investigations and Other Allied Studies" was made to The Surgeon General on 12 December 1945."

Larvicide DDT, Powder, Dissolving, stock number 51-L-120 for use of troops, was received in this Department in September 1944. The use of 5 percent solutions of DDT in oil for use as a larvicide was immediately effected. The following mimeographed letter was published for the information of the Command:

HEADQUARTERS PANAMA CANAL DEPARTMENT  
Office of The Department Commander

MIMEOGRAPH

LETTER NO. 82  
AG 710-3

APO 834

20 September 1944

SUBJECT: Larvicide, DDT, Powder, Dissolving.

TO: CGs, CAC, Sixth AF, MF & SC;  
Division Engineer;  
COs, all posts, camps and air bases.

1. A supply of Larvicide, DDT, powder, dissolving, stock number 51-L-120, has been received in this department and is now being issued by the Department Quartermaster. The allowance is 15 pounds per 1000 men per month.

2. This larvicide powder is issued for use in the preparation of oil sprays for the destruction of mosquito larvae breeding in casual water, impounded water or other natural waters in which mosquitoes are found breeding. Two and one-fourth (2-1/4) pounds of the larvicide, DDT, powder, dissolving, in five (5) gallons of oil yields a 5 percent solution. One (1) to two (2) quarts of 5 percent larvicide, DDT, powder in oil contains the recommended larvicidal dosage per acre of water surface, i.e., 0.1 pounds of the DDT powder.

3. Oils used in preparing the Larvicide.

a. Diesel Oil #2. The use of Diesel Oil #2 in the preparation of DDT larvicide solutions gives the best results. The resulting solution has a viscosity well suited for use in the hand sprayers or the knapsack sprayers now available.

b. Bunker "C" Crude Oil and used Crank-case oil. The use of these oils is slightly less satisfactory than Diesel Oil. They must be thinned by using 1 part of crude kerosene to 4 parts of the Bunker "C" Crude Oil or of the used Crank-case oil in order to obtain the fine spray required.

c. Kerosene (Crude). These oils are well suited for use where the dark colored heavy oils are to be avoided because of the possibility of staining clothing. In this department they should only be used when treating temporary water on golf courses.

#### 4. Preparation of Larvicide DDT Solutions.

a. Two and one-quarter (2-1/4) pounds by weight of Larvicide, DDT, powder, dissolving, should be added to each five (5) gallons of the oil used. The powder goes into solution slowly and, therefore, from 24 to 48 hours will be required to completely dissolve the powder which is added. The process may be hastened by placing the container in the sun in order to raise the temperature of the oil and by stirring occasionally during the 24 or 48-hour period.

#### 5. Methods of Use.

The completed DDT Larvicide should be applied to the surface of the water to be treated in the form of a fine spray by means of a hand or knapsack sprayer, using approximately one (1) to two (2) quarts of the DDT Larvicide per acre of water surface to be treated. Mosquito larvae are killed within twenty-four (24) hours after the application of the spray. The larvicide is effective against Anopheline larvae and also against Culicine and Aedes (pest mosquito) larvae. The 5 percent DDT larvicide solution when sprayed in this quantity is usually adequate for from six (6) to (9) days of control. Treatment once a week, checked by larva counts, should give effective control of an area. The best results are obtained through applying the larvicide as a fine spray utilizing the drift of the wind in order to reach inaccessible water surface. Drip cans are not satisfactory because of the tendency of the valve or flow vent to "freeze" due to the crystalizing of the DDT. Heavy rains following the application of DDT larvicide will cause dilution and decreased effectiveness. While the application of the DDT larvicide to flowing waters, such as streams or rivers, results in the death of the mosquito larvae coming in contact with the larvicide, no lasting control is obtained since the larvicide is swept away by the flowing water.

#### 6. Toxicity of Humans.

While the dry DDT powder is not absorbed by the skin, concentrated oily solutions are absorbed; large doses cause hyperirritability tremors, convulsions and liver damage. All personnel engaged in mixing or spraying the oily solutions of DDT, i.e., DDT Larvicide, should take precautions to prevent the material from spilling on or coming in contact with their skin. The DDT Larvicide should always be sprayed down wind in order to avoid the inhaling of the spray. The hands should be carefully washed after

handling DDT powder or DDT Larvicide since this substance is poisonous if taken internally. DDT Larvicide must not be applied to sources of water used by humans for drinking.

7. Toxicity to animals.

a. Fish. The spraying of DDT Larvicide on natural waters may result in the death of small fish, especially surface feeding fish.

b. Cattle. Since DDT is poisonous when taken internally, DDT Larvicide should not be applied to drinking holes used by cattle.

BY COMMAND OF MAJOR GENERAL MEYER:

s/HUGH J. DEENEY  
Colonel, Adjutant General's Department  
Adjutant General

The hand-spraying of casual water with DDT solutions was very successful and reduced the amount of oil used approximately 90 percent. The larvicidal action was more effective than the oil alone.

The Department Malaria Control officer carried out a series of tests of the effect of solutions of 5 percent DDT in kerosene and in diesel oil when applied to the surface of walls, screens, screen-doors and the outside of buildings. It was found that lethal action could be obtained by the use of a very fine spray approaching an aerosol, but that the most effective action resulted from the residual effect of the solutions of DDT applied to walls, screens, screen-doors and the exteriors of buildings. The most marked results were obtained in the reduction of the number of sand-flies that entered treated, screened rooms at night. Painting screens, screen-doors and the interior walls of the room controlled this nuisance. One application remained highly potent for not less than 30 days. This method of application of DDT was also effective against mosquitoes and flies. Neither insect was killed immediately and mosquitoes were observed to take blood meals after resting on a surface covered with residual DDT. Death occurred from 30 minutes to eight hours after resting on the DDT surface.

Cockroaches were the most resistant insect observed, but excellent reduction in infestation was obtained if the floors as well as the side walls were sprayed. The following mimeograph letter was published to the command on 27 March 1945 relative to use of Insecticide spray DDT-Residual Effect:

HEADQUARTERS PANAMA CANAL DEPARTMENT  
Office of The Department Commander

MIMEOGRAPH

LETTER NO. 36  
AG 441-1

APO 834  
27 March 1945

SUBJECT: Insecticide Spray DDT - Residual Effect.

TO: Commanding Generals, Sixth AF, CAC, MF & SG;  
Commanding Officers, all posts, camps and air bases.

1. The monthly allowance of insecticide spray DDT, residual effect, per 1000 men per month has been increased from 15 to 30 gallons for troops and to 40 gallons for hospitals. This insecticide spray is now being issued to the Department Quartermaster.

2. The insecticide being issued is a 5% mixture of DDT in kerosene. DDT has powerful action on the nervous system of insects. While the insects may not die immediately, a short time after exposure they drag their legs, their movements become poorly coordinated, and they finally develop tremors and convulsions prior to death. Death itself may not ensue for twelve (12) hours. DDT does not repel insects, but after receiving a lethal dosage, either from the air or from residual particles of DDT on surfaces, they become restless and attempt to escape, dying elsewhere. For this reason, it is possible that dead insects may not be found in treated areas.

3. Recommendations for use of insecticide spray DDT, residual effect, are as follows:

a. Against mosquitoes, flies and sand-flies:

The insecticide when sprayed in a very fine mist, i.e., aerosol, will kill mosquitoes, flies and sand-flies efficiently. However, the most effective action is obtained by means of the residual action of the spray which has been applied to screening, doors, walls, ceilings, latrines, light cords, garbage racks, etc. The mosquitoes, flies and sand-flies which light on surfaces properly treated with insecticide spray, DDT, residual effect will be killed in from 30 minutes to several hours even though the spray has become dry. All screens, walls, ceilings where practical, light cords, latrines and garbage racks should be sprayed not less than once a month with the insecticide spray, DDT, residual effect, using approximately one quart of the spray to each 300 square feet of

surface. The treated surface should be completely covered with the spray but the applied spray should not run or drip off. Smoking in rooms treated with insecticide spray, DDT, residual effect, should be prohibited until the morning following spraying.

b. Bedbugs. The use of about 250 cc. of insecticide per bed (including mattress, pillow, springs and bed-frames) has been shown to kill all bedbugs. Bedbugs introduced experimentally on treated beds about six months after such treatment were killed by the residual action of the DDT. Three and one-half (3-1/2) gallons of insecticide should prove adequate for a seventy (70) man barracks. The recommended technique is as follows:

- (1) All clothing, rubber material and other objects to be protected from kerosene should be covered or removed from barracks.
- (2) Workers should wear filter-type masks or moistened fine gauze masks over the nose and mouth.
- (3) Mattresses should be placed in piles of eight (8) to ten (10) each. Bunks, if movable should be placed on end along the walls so that excess spray will fall on walls.
- (4) Spray should first be applied to the outside surface of the pile of mattresses. Then the man operating the sprayer should apply the solution to one side of the top mattress, his assistant quickly turning it over to be treated on the other side, then moving it away while the kerosene is still visible, the sprayer begins on the second mattress. A slight moistening of the surface is all that is required a few minutes after spraying the kerosene will have partly evaporated leaving visible small glistening DDT crystals adhering to the surface. Pillows should be treated in the same manner.
- (5) A rapid spraying of springs and bedframes should follow the spray being directed toward the walls in order that excess spray may be deposited on them. If this is done, direct spraying of these surfaces will not be necessary. Otherwise walls of buildings should be sprayed lightly.

(6) Smoking in room should be prohibited until the following morning.

c. Roaches. The insecticide should be sprayed around pipes, on table legs, in cracks and other areas frequented by roaches.

4. Toxicity to Humans. The dry DDT powder is not absorbed by the skin and is therefore harmless unless taken internally. Oily solutions of DDT are absorbed by the skin and if large areas of the skin are covered with the spray for long periods of time absorption may take place. Personnel engaged in spraying or mixing oily solutions of DDT should wear a nose mask, made up of several layers of surgical gauze and should remove any of the solution that reaches the skin by washing with soap and hot water after completing the application of the insecticide spray, DDT, residual effect. Clothing heavily soiled with the spray should be removed on completion of the application of the spray.

5. Mess Halls. When insecticide spray, DDT, residual effect, is used in mess halls, care should be taken to prevent the contamination of food. All food and cooking utensils should be covered when this spray is being disseminated.

6. Mimeo graph Letter No. 69, this headquarters, 7 August 1944 is rescinded.

BY COMMAND OF LIEUTENANT GENERAL BRETT:

s/HUGH J. DEENEY  
Colonel, Adjutant General's Department  
Adjutant General

The directive relative to Malaria Control was revised and republished as Mimeo graph Letter No. 41, Panama Canal Department, 7 April 1945:

HEADQUARTERS PANAMA CANAL DEPARTMENT  
Office of The Department Commander

MIMEOGRAPH

LETTER NO. 41  
AG 710-3

APO 834

7 April 1945

SUBJECT: Malaria Control.

TO: CGs, Sixth AF, CAC, MF & SC;  
COs, all posts and camps.

1. Control of Mosquito Breeding. a. The Anopheles albimanus mosquito, principal transmitter of malaria in this area, breeds readily in small bodies of standing water, i.e., the so-called casual water in road ruts, depressions, discarded cans, blocked road ditches, clogged tile drains and water impounded because of construction activities.

b. The elimination of all small deposits of standing water in and about posts, camps, air bases and positions will result in a reduction of anopheles breeding and a reduction in the rate of primary malaria among the military and civilian personnel.

c. The attention of all responsible officers is called to the provisions of paragraph 55b (1) and (2), Panama Canal Department Regulations, (Instructions on prevention of malaria) and Mimeograph Letter No. 82, this headquarters, 20 September 1944.

d. It is directed that the following types of casual water be eliminated without delay by filling, grading, ditching and cleaning of ditches and tile drains:

- (1) Tire ruts in temporary, semi-permanent and permanent motor standing areas.
- (2) Puddles and pools resulting from heavy run off from roofs.
- (3) Tire ruts and depressions in road shoulders.
- (4) Impounded water resulting from broken down road shoulders and blocked road ditches.
- (5) Impounded water resulting from blocked invert tile ditches or other type of blocked drainage ditch.
- (6) Impounded water resulting from blocked culverts.

- (7) Impounded water at construction projects resulting from unfilled barrow pits, incomplete grading, tractor and bulldozer tracks, ruts caused by heavy trucks and blockage of natural lines of drainage.
- (8) Impounded water resulting from poorly drained roads and from temporary roads which have not been graded or ditched.

e. In order to obtain proper drainage and to eliminate mosquito breeding areas, all culverts will be placed so as to provide a minimum flow at all times. Culverts are usually installed so as to equalize the level of water on each side of the culvert and to permit flood water to run off. This method does not permit the complete drainage of impounded water.

f. All materials stored in the open will be so stored that water cannot accumulate under stock piles or in depressions in the stock piles or the material forming the stock piles.

2. Impounded water which cannot be eliminated by filling, grading or ditching will be treated once each week using a 5 percent (5%) mixture of Larvicide, DDT Powder, dissolving, in oil. The methods of preparation of this DDT larvicide and methods of application are set forth in Mimeograph Letter No. 82, this headquarters, 20 September 1944.

3. Mosquito-proofing of buildings. a. The constant maintenance in a mosquito-proof condition of all buildings used as barracks or quarters, kitchens, mess halls, recreation halls, latrines and all buildings in which military or civilian personnel work or gather between the hours of 1800 and 0630 will aid in the reduction of malaria. Reference is made to paragraph 55b (3), Panama Canal Department Regulations.

- (1) Screening. The screens on all buildings will be maintained in a mosquito-proof condition at all times. Screening of barracks, mess halls, kitchens, recreation halls, latrines and other buildings used at night by military and/or civilian personnel should be inspected daily. Minor repairs will be made at once by the designated malaria control orderly.

Major repairs will be referred to the respective post engineer. Screens will not be washed or cleaned except as set forth in paragraph 55b (3), Panama Canal Department Regulations.

- (2) Doors. All doors of buildings occupied or used by military or civilian personnel must open outward and will be maintained at all times in a mosquito-proof condition. All doors will be equipped with positive acting self-closing devices. Tight closure may be maintained by the application of garnishing of salvage duck, drill or camouflage cloth to the door jamb and the opposing door surfaces.
- (3) Side walls, eaves and roof trees. All cracks in side walls of buildings will be covered with salvage mosquito screening. The screening should overlap the cracks at least one inch on each side of the crack. Cracks and openings at the eaves or roof tree will be closed using the improvised caulking material composed of flour paste, shredded paper, sand and cement.

#### 4. Use of Anti-Mosquito sprays.

##### a. Dispensers, Freon-Aerosol.

- (1) All barracks and other buildings occupied by military or civilian personnel will be sprayed daily between 0500 and 0530 and between 1800 and 1900 using the dispenser, Freon-Aerosol. The dispenser should be used for four (4) seconds for each 1000 cubic feet of space to be sprayed.

b. Insecticide Spray, DDT, residual effect. The amount of this spray has been increased to 30 gallons per 1000 men per month for troops and 40 gallons per 1000 men per month for hospitals. It does not have the "knockdown" effect for mosquitoes that the Freon-Aerosol spray has but when applied to screens and the walls of buildings causes the death of mosquitoes that rest upon the treated surfaces. It is effective for long periods of time. Note: Care must be exercised not to contaminate food or beverages with this spray. Several thicknesses of surgical gauze are

sufficient. Clothing contaminated with spray should be removed upon completion of the spraying activities and all spray should be washed off the skin using soap and water.

- (1) Treatment of Screens. All screens will be sprayed once each month with the insecticide spray, DDT, residual. Wherever practicable the spray will be applied on the outer surface of the screen. If this is impracticable the insecticide spray, DDT, residual will be applied from the inside of the screen. This spray may be applied by means of the sprayer, liquid, insert, continuous spray, the sprayer, pump type or may be painted on with a paint brush. The spray should cover the screen but should not run in drops.
- (2) Treatment of Exterior Doors. All exterior doors should be treated once each month with insecticide spray, DDT, residual as set forth for treatment of screens in the preceding paragraph. In addition an area of the wall six (6) feet wide adjacent to the door should be sprayed or painted with the insecticide spray, DDT, residual.
- (3) Treatment of interior of buildings. The walls of all barracks, mess halls, kitchens, recreation halls, latrines and buildings used at night by military and civilian personnel will be sprayed or painted with insecticide spray, DDT, residual once each month. The walls should be covered with insecticide spray but the application should just be enough to prevent the oily spray from running after application.

5. Inspection and Reports. a. Post, camp, station and unit surgeons or their medical inspectors will make periodical inspections for the purpose of determining the following:

- (1) The presence of impounded water resulting from improperly placed culverts, the blockage of streams, seepage water and other water drainage by fills, temporary roads, or other construction projects or from improperly graded and drained fills.

- (2) The condition of screening in all post, camp or station buildings.
- (3) The effectiveness of door closing and the mosquito-proofing of doors.
- (4) The condition of the side walls, eaves and roof trees of all buildings, especially those of T/O type construction.

b. The commanding officer of each post, camp or station will submit a report to this headquarters on the last day of each month giving the following information:

- (1) The location and nature of all impounded water found as a result of inspection by the surgeon or his representative.
- (2) Proposed plan for remedying unsatisfactory conditions found.
- (3) Comment and recommendation of the commanding officer.
- (4) Whether necessary materials and facilities are available to complete work on the unsatisfactory conditions.
- (5) Condition of screening, doors, side walls, eaves and roof trees of barracks, mess halls, kitchens, latrines and other buildings occupied at night by troops.

6. Mimeograph Letter No. 1, this headquarters, 1943, is rescinded.

BY COMMAND OF LIEUTENANT GENERAL BRETT:

s/HUGH J. DEENEY  
Colonel, Adjutant General's Department  
Adjutant General

B. Relapsing Fever:-

Relapsing fever infections were of minor importance in the Panama Canal Department during the World War II period.

All military personnel were indoctrinated in the danger of visiting native habitations. Prior to going on pass or local furlough, all military personnel were given instructions relative to the necessity of avoiding native quarters, especially at night, and the danger of native hotels.

#### C. Typhus Fever:-

All military personnel visiting, passing through or being assigned to areas in the mountainous portions of Central and South America except the Canal Zone and the Republic of Panama were immunized against epidemic typhus. Stimulating doses were required each 6 months.

Typhus fever existed in the highlands of Guatemala and Ecuador during the World War II period. All military personnel were instructed relative to the methods of dissemination of the infectious agent of typhus fever, the vector, the life cycle of the vector, and the methods of avoiding infestation by the arthropod vector.

Areas in which typhus occurred were placed "Off Limits" to military personnel. There were no cases of typhus fever originating in the Panama Canal Department during the World War II period.

#### D. Chagas' Disease:-

There were two authenticated cases of Chagas' Disease hospitalized in the Panama Canal Department during the World War II period. Infection could only have occurred in this area since the infected individuals had not been out of the Panama Canal Department.

Instructions were given to troops with reference to the arthropod vector in Chagas' disease and the dangers of the failure to use the mosquito net at outlying positions were explained.

#### E. Dengue Fever:-

The anti-mosquito campaign assisted greatly in the prevention of dengue fever. All casual water was oiled, all containers emptied, and a general campaign against all mosquitoes instituted.

An anti-Aedes campaign was carried on in the city of Panama in 1942 and 1943. This campaign resulted in the reduction of the number of breeding areas available to the Aedes.

#### F. Sandfly Fever:-

The ubiquitous Phlebotomus was with the troops in the Panama Canal Department during the World War II period, quite contrary to the general concensus entomological opinion that the common biting fly, Culicoides was the only biting fly here.

The uniforms of all men going on guard or sentry duty during the night hours were lightly sprayed every two hours with pyrethrum in

kerosene (twenty-times concentrated pyrethrum, one part; kerosene, 19 parts). Excellent protection against sandfly bites was offered in this manner.

Spraying of the interiors of occupied buildings, screens, screen-doors and the walls about screen-doors was adopted in 1945. This practically ended the sandfly nuisance indoors.

There were no cases of sandfly fever in the Panama Canal Department during the World War II period.

#### G. Q-Fever:-

One case of Q-fever was reported. The rickettsial bodies were isolated and the strain established in guinea pigs. Only the general preventive measures against wood tick infestation were enforced in this Department, since prior to the discovery of this case of Q-fever the only tick-borne disease known was relapsing fever transmitted by O. telejs.

#### H. Yellow Fever:-

Jungle yellow fever is known to exist in the Province of Darien in the Republic of Panama. Special instructions relative to use of all protective measures against mosquitoes, and the maintenance of mosquito proofing of all buildings were given the small detachments on duty in this area. All men were instructed to take a cleansing bath immediately after returning from any trip into the jungle about their positions.

The coordinated malaria control and anti-mosquito projects initiated in this Department during the World War II period accomplished excellent results. At the close of the period reported upon, malaria had been greatly reduced, because of the permanent drainage installed in this Department.

Eternal vigilance must be the watch-word and malaria control discipline must be kept foremost in the mind of all military personnel in this area.

## OBSERVATIONS AND COMMENTS ON THE EFFICACY OF A NEW LARVICIDE AND SOME METHODS OF APPLICATION

### Introduction

With the advent of the dry season and incidental drying up of all areas of casual water of natural occurrence as lakes, ponds and small streams, the current investigations have been made using areas of mosquito breeding occurring in Gatun Lake.

Methods of distributing the larvicide include the water-kerosene emulsion, blend of oils and Grade II fuel oil as diluents.

In this series of investigations an attempt was made to determine the absolute minimum of the larvicide, both as to its concentration in the diluent and secondly as to the total amount of diluent necessary per unit area, required for a satisfactory larvicidal effect.

### Environmental Conditions

Prolific mosquito breeding, both Anopheles and Culex genus, were found in the headwaters of Gatun Lake, where during the latter part of the dry season when the lake level is below normal, huge areas of chara grass appear. This type of vegetation barely protrudes above the surface of the water and is so densely interwoven as to resemble a huge carpet, acres in extent. Due to one dense nature of the vegetation and its location in the headwaters of a huge body of impounded water, water currents per se hardly exist. A balancing factor, however, is the ever present trade winds which have ready access to the lake causing definite circulation of the upper surface level of the water with incidental wind directional movement of any material reposing on the surface of the water.

All areas under observation were completely exposed to sunlight.

Surface feeding minnows were present in great numbers and here is found a good example of the inadequacy of minnows of this variety when used as a mosquito breeding control measure, in dense water vegetation.

### Materials and Methods

A. Larvicide - known only as DDT or Gesarol.

B. Oils - as solvents; use was made of the water-kerosene emulsion, a blend of oils and the Grade II fuel oil. In addition to their use as diluents, other areas were treated with the three

diluent agents, without addition of DDT as controls. Dissolution of the DDT was obtained by moderate heating. Spreading properties of the diluent agents (oils) were not altered by the addition of such materials as cresylic acid, xylene, oleic acid, turpentine, soap, etc. Methods of applying the mixtures, consisted of the knapsack sprayer and in the instance of the Grade II fuel oil, of greater viscosity, an ordinary straw (house) broom was used. The latter method of distribution of oil is the suggestion of Col. Wesley C. Cox, M.C., U.S.A., Department Surgeon, Panama Canal Department.

1. Water-kerosene emulsion. So designated due to the lack of miscibility of water and kerosene. Distribution was made by knapsack sprayer using a finely divided spray.

2. Blended Oil. The blend used was comprised of the following component oils:

Diesel Fuel No. 2	-	70 parts
Grade II Fuel Oil	-	15 parts
Kerosene	-	15 parts

The spreading pressure of this blend is greater than that of castor oil and forming a surface film which was intact two hours following distribution. Penetration of the film through the vegetation was rapid being additionally disseminated by direct action of the wind. Distribution was made by knapsack sprayer using a finely divided spray.

3. Grade II Fuel Oil ("Bunker C"). Due to the extreme viscosity of this oil, distribution was made using an ordinary straw (house) broom. The oil being distributed over the boatside in a manner analogous to the sweeping action employed in cleaning a rug.

#### Procedures

Initial larval collections were made from all areas of chara grass considered for treatment for determination of type and density of breeding. The initial collections revealed that both Culex and Anopheles breeding was occurring in some density. Mansonia breeding was likewise present. Anopheles species present were A. albimanus and A. albitarsis.

The bodies of water were then treated in a specific manner as described below. Twenty-four (24) hours following treatment, a second larval collection was made to determine the killing effect of each control oil or larvicidal mixture. Daily larval collections were then made for eight (8) consecutive days followed by periodic collections over a total elapsed time period of fifteen (15) days in an attempt to determine the lasting effect of each treatment mixture.

The daily and periodic observation recorded both in actual breeding density and as percentages, illustrating the killing efficacy of each mixture, appear in Table I, II, and III. These percentage values are illustrated graphically, in an inverse relationship, over the total elapsed period of time, representing the lasting effect of the oil controls and oil-larvicide mixtures, on the attached sheets of ordinated paper labeled Graphs I to VIII inclusive.

The specific procedure of treatment of each breeding area is given below. All noteworthy observations or results and any factors affecting these results during the period of observation will be included in each instance.

#### Procedure A - Water-Kerosene Emulsion

1. A control mixture was distributed in a fine spray by knapsack sprayer at the rate of seven and one-half (7.5) gallons per acre over an area of seventeen one-hundredths (0.17) acre, thus establishing a control area. Agitation of the sprayer tank was sustained to assure as uniform mixture as possible.

A control mixture comprised of kerosene (20 cc.) and five (5) liters of lake water, containing kerosene in an amount roughly 0.4% by volume, was made.

The first larval collection twenty-four (24) hours following treatment revealed little and certainly not a significant killing effect. This of course was to be expected due to the insignificant oil content lowering oil mixture. Repeated larval collections on successive days following treatment revealed little depressant effect on mosquito breeding present for a period of fifteen (15) days.

Reference is made to Column "A" of Table I and to Graph I.

2. A stock solution, containing fifty (50) percent by volume DDT in pure white kerosene, was made. In an effort to obviate the shortcomings incidental to the DDT crystals in suspension, dissolution by heating was attempted. Incidental observations revealed that a 50% solution of DDT in kerosene was one of super saturation and that following cooling of the solution, crystallization resulted with the formation of a formed mass of DDT crystals, conforming to the shape of the container. As this physical state of the DDT precluded any attempt of its distribution, the physical solution of DDT was added to a volume of water sufficient to reduce its concentration to half with the resultant formation of an emulsion comprised of globules of DDT dissolved in kerosene and suspended as such in the diluent volume of water.

In the field, a volume of the above described water-kerosene DDT emulsion, equivalent to twenty-five (25) cubic centimeters of the 50% Kerosene-DDT solution, was diluted with water from the lake to a volume sufficient to make five tenths (0.5) percent solution of DDT by volume.

This mixture was distributed by knapsack sprayer at the rate of seven and one-half (7.5) gallons per acre over an area of seventeen one-hundredths (0.17) acre, containing DDT in a concentration for distribution at the rate of one two-hundredths (1/200) pound per acre of water containing Chara grass.

A larval collection made twenty-four (24) hours following treatment revealed some obvious larvicidal effect but nothing approaching a 100% kill. Lack of complete control by this method was additionally illustrated by the presence of all larval stages as well as pupae among the fraction of larvae and pupae remaining in the area following treatment. This fact is equally true for both Anopheles and Culex breeding.

Reference is made to Column "C" of Table I and to Graph III.

3. In an attempt to further determine the minimal lethal concentration of the water-kerosene-DDT emulsion, a volume equivalent to five (5) cubic centimeters of the kerosene-DDT stock solution (50)% was diluted with water from the lake to a volume sufficient to make a one-tenth (0.1) percent solution of DDT by volume.

This mixture was distributed by knapsack sprayer at the rate of seven and one-half (7.5) gallons per acre over an area of seventeen one-hundredths (0.17) acre, containing DDT in a concentration for distribution at the rate of one one-thousandth (1/1000) pound per acre of water containing Chara grass.

Larval collections made twenty-four (24) hours following treatment revealed little less larvicidal action than in the instance of the 0.5% solution. Again those collections made, contained larvae of all stages in addition to pupae illustrating a poor degree of larvidical activity in both Anopheles and Culex breeding.

Reference is made to Column "B" of Table I and to Graph II.

#### Procedure B - Oil Blend

1. The blend of oils, minus DDT was distributed by knapsack sprayer in a dosage of three and eight-tenths (3.8) gallons per acre over an area forty-six-hundredths (0.46) acre, establishing a control area.

The spreading properties of the oil blend were satisfactory, penetrating quite rapidly through the Chara grass, no doubt influenced to some degree by the action of strong winds. The oil film created was intact twenty-four (24) hours later and fragmentary patches were present three days following distribution.

Larvicidal action of the oil blend was slow, a 100% kill of all Anopheles larvae not being accomplished until four (4) days following distribution and in the instance of Culex larvae, a 100% kill was never obtained. This slow action apparently is based upon the necessity for all larvae killed to come into direct contact with the oil film to accomplish invasion of the tracheal apparatus. Complete control for Anopheles breeding was present only from the fifth to eighth day following treatment.

Reference is made to Column "A" of Table 2 and to Graph IV.

2. Using the oil blend as a solvent, a solution of one-tenth of one percent (0.1) by weight DDT in blended oil was made. As before, complete dissolution was obtained by heating the mixture moderately. The solution was then distributed by use of a knapsack sprayer, using a fine spray at the rate of five and one quarter (5.25) gallons per acre of thirty-four hundredths (0.34) acre containing DDT in a concentration for distribution at the rate of one-thousandth (1/1000) pound per acre.

The spreading properties and stability of film of this mixture were essentially the same as that of the control. However, a larval collection made twenty-four (24) hours following distribution revealed that an 80% killing effect had been exerted and a 100% kill of Anopheles larvae had been obtained on the third day following distribution of the larvicide mixture as compared with the four (4) days required for a 100% kill using the control oil.

Larvicidal action on Culex larvae was never more than 88% complete three (3) days following distribution of the larvicide.

3. A solution of five-tenths (0.5) of one percent by weight DDT in the oil blend was made and distributed by knapsack sprayer at the rate of five and one-quarter (5.25) gallons per acre, over an area of thirty-four-hundredths (0.34) acre containing DDT in a concentration for distribution at the rate of one two-hundredths (1/200) pound per acre.

There was no obvious departure of spreading properties of the oil mixture and the stability of film in this instance than that noted in paragraph 2 above.

This concentration of DDT and oil mixture again failed to obtain a 100% kill of Anopheles larvae after twenty-four (24) hours. Complete control, that is a 100% kill, was apparent two (2) days following distribution of the larvicide. This effect is comparable with four (4) days required for the oil control and three (3) days for the 0.1% mixture.

Culex larvae likewise were affected to a greater degree by the five-tenths (0.5) of one percent mixture of DDT than in the instance of the 0.1% DDT mixture.

Reference is made to Column "C" of Table 2 and to Graph VI.  
Procedure C - Grade II Fuel Oil

1. A control area was created by applying Grade II Fuel Oil by ordinary straw (house) broom, using a sweeping action to distribute the oil over the Chara grass. The oil was distributed at the rate of 2.94 gallons acre over an area of thirty-four-hundredths (0.34) acre.

An immediate and stable film resulted by the heavy viscous oil being dispersed finely by the large surface area comprised of individual fibers of the broom when in contact with an even greater surface area represented by the Chara grass. Furthermore, a reservoir for the replenishment of the oil film was established by heavier globules of oil adhering to the fibers of Chara grass and capable of being dispersed by the wind and rain.

The oil film, from Grade II Fuel Oil, was intact three (3) days following distribution and fragmentary oil patches seven (7) days after distribution.

The larvicidal action of the control Grade II Fuel Oil was not complete (100%) kill until the third day following distribution, attaining this effect in an accumulated manner and apparently due to the necessity of contact oiling of each larvae. Accordingly, the larvicidal action was less on Culex larvae than that noted for Anopheles larvae.

Reference is made to Column "A" of Table 3 and to Graph VII.

2. A larvicidal mixture was made containing DDT in a concentration of 0.5% by weight and distributed in the same manner as the control at the rate of 2.94 gallons per acre, over an area of thirty-four (0.34) acre containing DDT in a concentration for distribution at the rate of one two-hundredths (1/200) pound per acre.

The spreading properties and stability of film of the oil was not altered by the addition of DDT.

Larval collections twenty-four (24) hours following treatment revealed 100% kill of Anopheles larvae and slightly less effect on Culex larvae. This picture contrasts greatly from that effect exerted by the control oil as described in paragraph 1 above.

Reference is made to Column "B" of Table 3 and to Graph VIII.

#### Presentation of Statistics

Mathematical statistical methods are employed in this report to qualify the observations and data enumerated above and the opinions predicated on such data.

All observations made during the experimental period have been combined and formulated into frequency distribution tables (Table 4 and 5) showing the frequency with which any single observation occurred during the sixteen (16) days experimental period. Furthermore, to clearly describe the frequency distribution and to permit comparison between frequency distributions, the range of breeding density, arithmetic average or mean, deviation of each observation from the mean, standard deviation and the coefficient of variation have been recorded in Tables 6, 7, 8, and 9.

The degree of scatter, or variability, of observations about each specific mean for both control and treated groups is equally small in each case and does not permit significant conclusions to be drawn. It is thought that the small amount DDT used in the larvicidal mixtures is too small to exert significant lethal action on mosquito larvae over and above the larvicidal action afforded by the control factor. Substantiation of this observation is made in the evidence that in every instance a 0.5% concentration of DDT exerted slightly more effect than that afforded by the 0.1% DDT mixture; however, the variability is not sufficiently large to be significant.

Statistical evidence again indicates that DDT mixtures have less larvicidal action on Culex larvae than that observed on Anopheles larvae.

Coefficients of variation as given in Table 4 are for substantiation of the standard deviation and mean in describing the frequency distribution of each group of observations.

#### CONCLUSIONS

1. A third group of experimental procedures have been observed for the purpose of attempting to determine the minimum lethal concentration of DDT in oil necessary for complete larvicidal (Anopheles)

effect. Included in these procedures is a continued study of the larvicidal action of a water-~~kerosene~~-DDT emulsion.

2. In the volume of oil employed for distributing DDT, i.e., approximately five (5) gallons per acre in the instance of the oil blend and approximately three (3) gallons per acre in the instance of Grade II Fuel Oil, 0.1% and 0.5% concentration of DDT by weight proved inadequate for a 100% larval kill.

3. It is concluded that a 0.1% concentration DDT is wholly inadequate as an efficient larvicide when distributed at the rate of 1/1000 pound per acre.

4. A 0.5% concentration DDT by weight is satisfactory when distributed in oil dosages equivalent to nine (9) gallons of oil per acre.

5. The water-kerosene-DDT emulsion per se does not afford a physical state compatible for its equal distribution by knapsack sprayer. Used as described in the foregoing report, the larvicidal action is negligible.

It is thought that the addition of an emulsifying agent to the water-kerosene-DDT mixture might obtain more complete dispersion of the solid matter as to afford proper distribution.

It is likewise concluded that the DDT for dissolving is not amenable to distribution as an emulsion as would be the micronized DDT at present unavailable in this Department.

6. Grade II Fuel Oil as distributed by the broom method described above containing DDT in a concentration of 0.5% by weight proved to be a moderately efficient larvicidal mixture only.

TABLE 1. -- Breeding Density and Killing Effect (Percentage) By Days Before and Following Treatment

Chrono- logical Observations	Areas Treated With Water-Kerosene Emulsion As A DDT Diluent "C"					
	"A"			"B"		
	Control Area Minus DDT		0.1% DDT Treated Area		0.5% DDT Treated Area	
	Anopheles	Culex	Anopheles	Culex	Anopheles	Culex
Pre-Treatment	Density	% Kill	Density	% Kill	Density	% Kill
* 1st Day	18	-	12	-	18	-
2nd Day	16	11	6	50	5	15
3rd Day	10	44	8	53	10	44
4th Day	8	55	8	33	10	44
5th Day	12	33	6	50	8	55
7th Day	14	22	10	17	7	61
8th Day	12	33	10	17	8	55
12th Day	15	17	8	33	10	44
14th Day	16	11	8	33	18	-
15th Day	14	22	8	33	18	-

\* Post Treatment

Density - Breeding Density (Number Larvae per Dip).

TABLE 2. -- Breeding Density and Killing Effect (Percentage) By Days Before and Following Treatment

Chrono- logical Obser- vations	Areas Treated With A Blend of Oils As A DDT Diluent										0.5% DDT Treated Area		
	Area "A"			Area "B"			Area "C"			Treated Area			
	Control	Area Minus DDT	Culex	Anopheles	Culex	Anopheles	Culex	Anopheles	Culex	Anopheles	Culex	% Kill	
Pre-Treatment	16	-	10	-	20	-	8	-	12	-	6	-	
* 1st Day	13	19	15	-	4	80	5	38	6	50	8	83	
2nd Day	4	75	4	60	3	85	4	50	0	100	1	100	
3rd Day	1	94	2	80	0	100	1	88	0	100	0	83	
4th Day	0	100	2	80	0	100	1	88	0	100	1	67	
5th Day	0	100	3	70	0	100	2	75	1	92	2	50	
7th Day	1	94	3	70	1	95	3	63	1	92	3	50	
8th Day	2	88	3	70	3	85	2	75	3	75	3	-	
12th Day	12	25	8	20	6	70	3	63	6	50	12	-	
14th Day	12	25	8	20	14	30	6	25	6	50	10	-	
15th Day	12	25	8	20	14	30	6	25	6	50	8	-	

\* Post Treatment

Density - Breeding Density (Number Larvae per Dip).

TABLE 3. -- Breeding Density and Killing Effect (Percentage) By Days Before and Following Treatment.

Chronological Observations	Areas Treated With Grade II Fuel Oil As A DDT Diluent					
	"A"			"B"		
	Control Area		Minus DDT	0.5% DDT		Treated Area
	Anopheles	Culex	Anopheles	Culex	Anopheles	Culex
	Density	% Kill	Density	% Kill	Density	% Kill
Pre Treatment	8	-	8	-	8	-
* 1st Day	2	75	4	100	0	50
2nd Day	1	88	6	100	0	25
3rd Day	0	100	3	100	0	63
4th Day	1	88	3	100	0	63
6th Day	1	88	3	100	0	63
7th Day	3	63	6	100	0	25
11th Day	8	-	6	38	5	25
13th Day	6	25	8	25	6	-
14th Day	4	50	6	50	4	25
					6	6

\*Post Treatment

Density - Breeding Density (Number Larvae per Dip).

TABLE 4. --Frequency Distribution of Breeding Density

Breeding Density Pre- and Post- Treatment	Area Treated With Water- Kerosene Emulsion "Control"	Area Treated With 0.1% DDT in Water-Kerosene Emulsion	Culex	Anopheles	Culex	Anopheles	Culex
0	0	0	0	0	0	0	0
5	0	0	1	0	0	0	0
6	0	2	0	1	0	0	0
7	0	0	1	0	0	0	0
8	1	6	2	2	2	1	4
10	1	2	4	4	4	4	4
12	3	1	0	2	4	2	2
14	2	0	0	0	0	0	0
15	1	0	0	1	0	1	1
16	2	0	0	1	1	0	0
18	1	0	3	0	1	1	0
Mean -	12.16	8.36	11.09	11.81	10.63	10.09	10.09

TABLE 5.--Frequency Distribution of Breeding Density

Breeding Density Pre- and Post-Treatment	Area Treated With A Blend of Oils "Control"	Area Treated With 0.1% DDT in A Blend of Oils	Area Treated With 0.5% DDT in A Blend of Oils	Area Treated With Grade II Fuel Oil "Control"	Area Treated With Grade II Fuel Oil	Area Treated With 0.5% DDT in Grade II Fuel Oil
	Anopheles	Culex	Anopheles	Culex	Anopheles	Culex
0	2	0	3	0	1	0
1	2	0	1	2	3	6
2	2	2	0	0	0	0
3	0	3	2	1	1	3
4	1	1	1	0	1	1
5	0	0	1	0	0	0
6	0	0	2	4	1	0
8	0	3	0	1	2	2
10	0	1	0	0	0	0
12	3	0	0	1	0	1
13	1	0	0	0	0	0
14	0	0	2	0	0	0
15	0	0	0	0	0	0
16	1	0	0	0	0	0
20	0	0	1	0	0	0
Mean -	6.63	6.00	5.90	3.72	3.09	4.81
						2.90

TABLE 6.—Means, Standard Deviations, Coefficients of Variation and the Range of Breeding Density (Based on a Minimum Eleven Observations of Mosquito Breeding)

Observations	Mean		Standard Deviation		Coefficient of Variation		Range of Breeding	
	Anopheles	Culex	Anopheles	Culex	Anopheles	Culex	Anopheles	Culex
Control Area								
Water-Kerosene Emulsion	12.16	8.36	3.10	1.74	25.46	20.81	0-18	0-12
Area Treated with 0.1% DDT in Water-Kerosene Emulsion	11.09	10.63	4.79	2.97	42.38	27.93	0-18	0-16
Area Treated with 0.5% DDT in Water-Kerosene Emulsion	11.81	10.09	2.24	2.21	10.49	21.90	0-18	0-15
Control Area Blend of Oils	6.63	6.00	6.28	4.14	94.72	69.00	0-16	0-15
Area Treated with 0.1% DDT in a Blend of Oils	5.90	5.72	6.91	2.28	117.11	61.29	0-20	0-8
Area Treated with 0.5% DDT in a Blend of Oils	3.72	4.90	3.82	4.08	102.68	83.47	0-12	0-12
Control Area Grade II Fuel Oil	3.09	4.81	3.00	2.01	97.08	41.78	0-8	0-8
Area Treated with 0.5% DDT in Grade II Fuel Oil	2.09	2.90	3.13	2.54	149.76	23.20	0-8	0-8

TABLE VII

Eleven Observations of Mosquito Breeding As Influenced By Water-Kerosene-DDT Emulsion

Chronological Observations	Breeding Density Control Areas			Breeding Density Area of 0.1% DDT			Breeding Density Area of 0.5% DDT			Deviation Of Each Observation From Mean			Square Of Each Deviation From The Mean - "A"					
	#A			#B"			#C"			#B"			#C"					
	Anoph.	Culex	Anoph.	Anoph.	Culex	Anoph.	Anoph.	Culex	Anoph.	Anoph.	Culex	Anoph.	Culex	Anoph.	Culex			
Per Treatment	18	12	18	16	18	10	45.84	43.64	46.91	5.37	6.19	-	34.11	13.25	47.75	28.84	4.89	
1st Day	16	6	5	15	8	8	43.84	-2.36	-6.09	4.37	3.81	-2.00	14.75	5.57	37.09	19.10	14.52	
2nd Day	10	8	10	12	10	10	-2.16	-0.36	-1.09	1.37	1.81	-	4.67	0.13	1.19	1.88	3.28	
3rd Day	8	8	10	8	10	8	-4.16	-0.36	-1.09	-2.00	-1.81	-2.00	17.31	0.13	1.19	6.92	-	
4th Day	12	6	8	10	12	8	-0.16	-2.36	-3.09	0.16	0.63	0.19	0.03	5.57	9.55	0.40	0.04	
5th Day	12	8	7	12	10	8	-0.16	-0.36	-4.09	1.37	1.81	-2.00	0.03	0.18	16.73	1.88	3.28	4.00
7th Day	14	10	8	10	16	10	41.84	41.64	-3.09	0.63	4.19	-	3.39	2.69	9.55	0.40	17.56	-
8th Day	12	10	10	8	10	10	-0.16	41.64	-1.09	2.63	1.81	-	0.03	2.69	1.19	6.92	3.28	-
12th Day	15	8	10	12	15	15	42.84	-0.36	-1.09	0.63	0.19	5.00	8.07	0.13	1.19	0.40	0.04	25.00
14th Day	16	8	18	10	12	12	43.84	-0.36	46.91	0.63	0.19	52.00	14.75	0.13	47.75	0.40	0.04	4.00
15th Day	14	8	18	6	12	12	41.84	-0.36	46.91	4.63	0.19	52.00	3.39	0.13	47.75	21.44	0.04	4.00
Sum	147	92	122	117	130	111	40.04	40.04	40.04	40.04	40.04	40.04	40.04	40.04	40.04	40.04	40.04	40.04
Mean	12.16	8.36	11.09	10.63	11.81	10.09	S.D. -	S.D. -	S.D. -	S.D. -	S.D. -	S.D. -	S.D. -	S.D. -	S.D. -	S.D. -	S.D. -	S.D. -

\* Post Treatment

S.D. ■ Standard Deviation

EXHIBIT D-14

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 AUTH: WD CIC No. 4 5 June 1948  
 DATE: DEC 30 1947  
 CAPTAIN V. B. TAYLOR, PC  
 Historical Division



TABLE VIII

Eleven Observations of Mosquito Breeding As Influenced By a Blend Of Oils And DDT

Chronological Observations	Breeding Density Control Area			Breeding Density Area of Sity			Deviation of Observation From Mean			Square of Each Deviation From The Mean		
	#A			#B			#C			#D		
	Anoph.	Culex	Anoph.	Culex	Anoph.	Culex	Anoph.	Culex	Anoph.	Culex	Anoph.	Culex
Pre Treatment	16	10	20	8	12	6	49.37	44.00	-14.10	44.28	-1.10	87.80
* 1st Day	13	15	4	5	6	8	46.37	49.00	-1.90	41.28	42.28	16.00
2nd Day	4	4	3	4	0	1	-2.63	-2.00	-0.28	-3.72	-3.90	40.58
3rd Day	1	2	0	1	0	0	-5.63	-4.00	-5.90	-2.72	-3.72	16.00
4th Day	0	2	0	1	0	1	-6.63	-4.00	-5.90	-2.72	-3.72	16.00
5th Day	0	3	0	2	1	2	-6.63	-3.00	-5.90	-1.72	-2.72	16.00
7th Day	1	3	1	3	1	3	-5.63	-3.00	-4.90	-0.72	-2.72	16.00
8th Day	2	3	3	2	3	3	44.63	-3.00	-2.90	-1.72	-0.72	16.00
12th Day	12	8	6	3	6	12	45.37	42.00	0.10	-0.72	42.28	16.00
14th Day	12	8	14	6	6	10	45.37	42.00	48.10	42.28	45.10	16.00
15th Day	12	8	14	6	6	8	45.37	42.00	48.10	42.28	43.10	16.00
Sum	73	66	65	41	54	40.08	0.00	0.00	40.10	40.08	40.10	3.82
Mean	6.63	6.00	5.90	3.72	4.90				S.D. ■			
										6.28	4.14	4.08

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AUTH: WD Grc No. 4, 5 June 1945  
 DEC 30 1947  
 DATE: CAPTAIN V. B. TAYLOR, PC  
 Historical Mission

# Post Treatment

S.D. = Standard Deviation

EXHIBIT D-15



TABLE IX

## TEN OBSERVATIONS OF MOSQUITO BREEDING AS INFLUENCED BY GRADE III FUEL OIL AND DDT

Chronological Observations	Breeding Density Control Area		Breeding Density Area of 0.5% DDT		Deviation of Each Observation From Mean				Square of Each Deviation From Mean						
	"A"	Anopheles	"B"	Culex	Anopheles	"A"	Anopheles	Culex	"B"	Anopheles	Culex	"A"	Anopheles	Culex	"B"
Pre-Treatment	8	8	8	6	4.91	+3.19	+5.91	-3.10	24.11	10.18	34.93	9.61			
* 1st Day	2	4	0	1	-1.09	-0.81	-2.09	-1.19	1.19	0.66	4.37	3.61			
2nd Day	1	6	0	2	-2.09	+1.19	-2.09	-0.90	3.37	1.42	4.37	0.81			
3rd Day	0	3	0	1	-3.09	-1.81	-2.09	-1.90	9.55	3.28	4.37	3.61			
4th Day	1	3	0	2	-2.09	-1.81	-2.09	-0.90	4.37	3.28	4.37	0.81			
6th Day	1	3	0	1	-2.09	-1.81	-2.09	-1.90	4.37	3.28	4.37	3.61			
7th Day	3	6	0	2	-0.04	+1.19	-2.09	-0.90	0.0081	1.42	4.37	0.81			
11th Day	8	6	5	3	+4.91	+1.19	+2.91	-0.10	24.11	1.42	8.47	0.01			
13th Day	6	8	6	8	+2.91	+3.19	+3.19	-5.10	8.47	10.18	15.29	26.01			
14th Day	4	6	4	6	+0.91	+1.19	+1.19	-3.10	0.83	1.42	3.65	9.61			
Sum	34	52	23	32	+4.90	+3.10	+2.10	-3.00	81.37	36.54	88.56	58.50			
Mean	3.09	4.81	2.09	2.90				S.D.	3.00	2.01	3.13	2.54			

\* Post Treatment  
S.D. = Standard Deviation

EXHIBIT D-16

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AUTH: *[Signature]* No 4, 5 June 1945DATE: DEC 30 1947  
CAPTAIN V. B. TAYLOR, PC  
Historical Division



## CHAPTER 15

## Miscellaneous Infections

5



The miscellaneous preventable diseases of military importance are so grouped because they do not fall into the four main classifications of communicable diseases, i.e., the respiratory diseases, the intestinal diseases, the insect-borne diseases and the venereal diseases. This group included anthrax, beri-beri, granuloma inguinale, infectious jaundice, rabies, scabies, scurvy, tetanus, tinea cruris, trachoma and yaws.

a. Anthrax.

Anthrax exists in the portions of Central and South America included in the territorial limits of the Panama Canal Department. During the World War period, there were cases reported in cattle in Colombia, Guatemala, Nicaragua, and Honduras.

There was no occasion for troops in this area to come in contact with infected animals. Military personnel did not work with the raw or dried skins, hair or wool of animals in this area.

All shaving brushes on sale in post-exchanges were of United States manufacture and were properly sterilized by the manufacturer.

b. Beri-Beri.

The careful control of the composition of the master menus in this Department precluded the development of beri-beri.

c. Granuloma Inguinale.

There were no cases of granuloma inguinale among troops in this area despite the high percentage of Negroes in the native population. Personal cleanliness was constantly stressed and the campaign for universal prophylaxis following the risk of exposure to venereal disease was energetically carried on.

d. Infectious Jaundice.

The outbreak of infectious jaundice which followed the immunization of all military personnel this Department with an attenuated yellow fever vaccine was self-limited.

A constant campaign for the eradication of rats was constantly carried on. All buildings were rat proofed. Rat curtain foundations were used. Dunnage was required in all store-yards, depot-buildings, and store rooms.

Rat-trapping was constantly carried on. Samples of all rat catches were sent to the laboratory where post mortem examinations were made. Guinea pig inoculations were made in cases exhibiting any suspicious lesions. There were no findings of *L. icterohaemorrhogiae*.

e. Rabies.

The Republic of Panama and the Canal Zone are free of rabies. There have been no cases originating in this area in over 30 years. Dog and animal pets are placed in quarantine for a period of 6 months following arrival in the Canal Zone.

All troops were warned relative to the danger of rabies in Central and South American countries.

Vaccination of all dogs with rabies vaccine was practiced.

In all cases of bite by a dog or other small animal, the animal was placed in quarantine for 15 days if available. If bite occurred and the animal could not be identified and placed in quarantine, anti-rabies treatment was given routinely.

f. Scabies.

Routine physical examinations of all enlisted personnel were regularly conducted in accordance with Army Regulations. Any case of scabies detected was immediately placed in quarantine and treatment started. The clothing and bedding of each case was disinfected.

All cases observed in this Department were recent arrivals from the United States.

The constant maintenance of high standard of personal hygiene in this Department, the adequate sunning of bedding, the use of sheets on all cots, bunks, and beds, and the adequate provision for laundry facilities prevented the development of infection with the *Sarcoptes scabiei*.

g. Scurvy.

Scurvy was prevented by the provision of adequate quantities of vitamin C in the diet. Citrus fruits were always readily available.

h. Tetanus.

All military personnel of this Department were immunized with tetanus toxoid and the stimulating doses were given as required six months after the initial immunization.

All punctured wounds, lacerated wounds, contused-lacerated wounds, and all suspected snake-bites were given a stimulating dose of tetanus toxoid routinely following emergency treatment.

i. Tinea Cruris.

Tinea cruris infections were common in this Department. All measures of personal hygiene were employed. Susceptible individuals were urged to bathe twice daily and to briskly rub all parts of the body dry with a clean towel paying special attention to the axillae, the groin and the toes.

All personnel were directed to dry the ear canals following showering or bathing.

The use of the issue foot-powder under the arms, about the groin, and between the toes was stressed. Two sets of duck-boards were required for each shower. These were used on alternate days, the set not in use being sunned on the idle day.

A special effort was made to discourage the habit of walking about the squad rooms in bare feet. The use of shoes, slippers, or wooden clogs was encouraged.

Shoes were disinfected at the quartermaster reclamation plant.

Routine foot examinations were made at all physical inspections.

j. Trachoma.

No cases of trachoma were observed in this Department during the World War II period.

k. Yaws.

Endemic foci of yaws exist in the Central and South American Republics within the Panama Canal Department. The disease is common among the children in these endemic areas.

Adequate and energetic campaigns against flies and other insects were carried on at all times. All buildings used by troops were screened. Fly sprays (Pyrethrum 1-20, one part and Kerosene 15 parts) were used in all kitchens and mess halls. Fly traps were used at all stations. The interior of all buildings were sprayed with 5% DDT solution in diesel oil at monthly intervals in August 1944.

All personnel were given instruction in the appearance of the lesions of yaws as part of the instruction in venereal disease.

## CHAPTER 16

### Nutritional Diseases

Reference is made to Chapter 4, Volume I, Nutrition.

With the exception of one case of sprue in a recently arrived Insular enlisted man and an occasional case of malnutrition resulting from self limitation of intake of food due to religious beliefs, there were no dietary diseases in the Panama Canal Department during the World War II period.

All sources of food were carefully inspected. The Department Ration Board reviewed all the Master Menus two months in advance of issue. The adequacy of protein, fat and carbohydrate components was checked and changes made where necessary. The caloric value was checked. The daily menu averaged 3800 calories during the World War II period. Vitamin and mineral salt content was determined and quantities greater than the prescribed minimum were always provided.

Methods of preparation and cooking of foods were introduced which conserved the natural mineral salt content of the component items of the ration.

Fresh milk was provided for all troops located where delivery of fresh milk from properly authorized sources was possible. Powdered milk was used in sauces, puddings and in the preparation of creamed soups and vegetables. Ice cream was issued to troops who did not get fresh milk. Aircraft delivery of ice cream was utilized.

Multiple vitamin capsules were issued to aircraft crews and boat crews who made long flights and trips and who were unable to be supplied with the Master Menu while on this duty.

Field ration inspectors regularly and frequently checked the meals as prepared in order to insure the use of the Master Menu.

The Department Veterinarian and his representatives inspected all meat and dairy products for wholesomeness and cestode infestation.



## CHAPTER 17

### Environmental Disease

The Panama Canal Department lies within the north and south tropical zones of the Western Hemisphere. The climate within this area varies greatly due to the marked variations in altitude and the effects of sea currents such as the Humboldt Current which produces the arid areas along the coasts of Ecuador and Peru.

The lowlands in the Canal Zone and the Republic of Panama are characterized by high relative humidity which ranges from 70 percent in the dry season to 100 percent in the wet season. The temperature range varies from the extreme low of 65 degrees F. to 98 degrees F. The daily average variation of temperature is approximately 20 degrees. There are two seasons, the wet and the dry. The early dry season is marked by the appearance of the trade winds which blow constantly for approximately 3 months. There is little rain during this period. With the advent of the wet season, daily mean temperatures increase, the trade winds die off, humidity increases, and the climate is very enervating. The rains bring a reduction of mean daily temperatures and greatly increased humidity.

The mountainous sections of the Department, such as the stations at Guatemala City, Guatemala, and San Jose, Costa Rica, have a much more salubrious climate. Mean daily change in temperature is approximately 35 degrees F. Wool clothing is comfortable at night. Humidity during the wet season is high.

Seymour Island, Galapagos Island, Talara, Peru and Salinas, Ecuador, although situated approximately on the Equator have exceptionally healthful climates and very little rain. Daily changes in temperature average about 40 degrees, with temperature variations from 50 to 90 degrees F. Mean relative humidity averages about 60.

The lowlands in Guatemala, Nicaragua and Costa Rica have a climate approximating that of the lowlands of Canal Zone and the Republic of Panama.

Reaction to Influence of Surroundings. The average person assigned to this Department had very little difficulty in becoming acclimated. The influence of the surroundings were more important than the influences of the climate. Unfortunately, the majority of enlisted men experienced comparative social isolation in this area. This was especially true of the inductees arriving here following Pearl Harbor. These men had been separated from their normal environment. They had expected to find solace in the excitement of an active theater, but were faced with the monotony of a

constant alert status, without any possibility of glory. There was a dearth of the normal social recreational outlets so dear to the hearts of young Americans. Language barriers made social contacts in the interior of the countries embraced by the Panama Canal Department difficult. Homesickness and ennui developed.

Psychoneurosis and Psychosis. The majority of the officers and enlisted men adapted themselves to the influences of their surroundings. There were many however, who, because of inherent inadequate personalities, soon found themselves unable to cope with the situation. These individuals developed behavior changes and evidenced symptoms of psychoneurosis, mostly of the anxiety or situation type.

With the arrival of Insular troops in this Department, the number of cases of psychoneurosis and true psychosis increased. The Insular Soldier did not adapt himself as well to the influences of his surroundings as did the Continental. The rate per thousand per annum of individuals returned to the United States and to Puerto Rico showed a steady increase each calendar year until V-J day when there was a plummet-like decrease.

A vigorous athletic and recreation program was conducted in this Department from 1 January 1940 until the development of the Special Service Section in 1941. The special service officers conducted excellent programs of all types: athletic, educational, and recreational.

Troops were forced to carry on under primitive environmental conditions during 1941, 1942, and early 1943, while construction of T/O type barracks and hutments was in progress. Many units lived under tentage. Double bunking of barracks was required. However, the rate for return to the United States and to Puerto Rico increased during 1943 and 1944 when all troops were adequately quartered in well equipped, mosquito-proof barracks and hutments, when the special service program was most adequately organized, when the ration was excellent, and admission rate for disease lower than at any time in the history of the Department.

The individual who was subject to a neuropsychiatric disorder prior to enlistment, or prior to being transferred to the tropics does not adapt well. In the case of Insular troops, 44 percent of a group studied were known to have had a neuropsychiatric disorder prior to induction.<sup>6</sup>

Careful neuropsychological screening prior to embarkation would have eliminated approximately 50 percent of the cases of neuro-psychoses developing among Insular Troops and approximately 25 percent of those developing among Continental troops.

Sunburn. Despite the fact that all personnel were constantly warned against undue exposure of the unclothed body to the direct rays of the sun, there were many cases of sunburn. These varied from mild primary degree burns to severe secondary degree burns requiring hospitalization. Most of the secondary degree burns resulted from men falling asleep on the beach, clothed only in bathing trunks.

Uniform regulations required that the trunk be clothed at least by an undershirt at all times when on duty.

Miliaria. Miliaria due to excessive sweating was frequently observed. It was found that individuals having an adequate salt balance suffered less from miliaria than those who lacked salt.

Clothing did not seem to be correlated with the appearance of miliaria. Officers and enlisted men who exercised in sleeveless shirts and shorts frequently developed miliaria on their arms and legs.

The occurrence of miliaria was definitely associated with increased atmospheric temperature and the rate of this condition always rose at the end of the dry season when mean daily temperatures were highest.

The use of salt tablets was routine in this Department. Tablets were kept available at the unit water fountains, at the unit messes, and at the barracks. All individuals were instructed in the use of these tablets and carried a supply on their person when on duty. Salt tablets were always available during athletic contests.

Heat Cramp. The commonest effect of climate was the occurrence of heat cramps. In this area, this condition universally follows a lowering of the salt content of the blood and tissues. It was observed during the World War II period in all grades of military personnel in this area from Private to Lieutenant General.

The use of salt tablets was enforced in this Department but unfortunately practically every member of the military here had to personally experience the effect of lack of proper salt balance before the need for additional salt was thoroughly and completely learned. An attack of cramps involving the feet and legs and hands and arms taught more by actual experience than all the lessons given.

Heat Exhaustion. Despite the use of proper clothing, adequate salt intake, adequate diet, and proper housing, cases of heat exhaustion were fairly common. There were no fatalities. The most consistent symptom was fainting. The individual might be performing heavy muscular exercise or merely standing at attention

on the drill field when seized by a feeling of weakness and dizziness accompanied by profuse sweating, then sudden monetary loss of consciousness.

Heat Stroke. Insulation fever or heat stroke was rarely observed in this Department during the World War II period. The single fatal case followed the completion of a 15-mile hike. This individual had partaken of considerable alcohol the previous night.

Medical officers always accompanied units on training marches and were present during periods of combat training. Every effort was made to condition the individual physically by gradually increasing amounts of physical exercise. All marches were broken at hourly intervals and the pace set was slow. Heavy packs were not carried. March discipline was strictly enforced. Salt tablets were taken routinely.

There were no environmental diseases caused by cold in this Department.

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1. Mimeograph Letter No. 77, file AG 426.1-1 Hqs Panama Canal Department, dated 3 September 1942, letter file PCD-AG 426.1-1, sub: Control of Venereal Disease.
2. Circular No. 152, paragraph 2, Hqs Panama Canal Department, dated 20 November 1942. Paragraph 2 follows: "2. THE USE OF PYROCIDE KEROSENE SPRAY AS A MOSQUITO REPELLENT. a. Extract of pyrethrum in kerosene has been determined to possess excellent qualities as a mosquito repellent. The standard pyrethrum spray is made up of Pyrocide -20 (or equal), one (1) part and kerosene, nineteen (19) parts. b. Protection against mosquito bites because of the repellent action of the pyrethrum-kerosene mixture may be obtained by lightly spraying the uniform of military personnel required to perform military duties outside of screened buildings or screened tents between the hours of 1800 and 0630. c. The pyrethrum-kerosene spray should be lightly applied to the uniform front and rear, care being taken not to apply the spray to the uncovered skin. d. In event tour of duty is longer than two (2) hours, the uniform should be re-sprayed at the end of each two hours of exposure. (Misc Div) (AG 710-3) (D Surg)
3. Report by Lt Col Paul F Russell, MC, AUS, to TSG, Wash, DC, 27 Nov 42, sub: Malaria tour in the Panama Canal Department, in file CDC-S 710.
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THE PREVENTION OF DISEASE IN THE UNITED STATES ARMY DURING  
WORLD WAR II  
THE PANAMA CANAL DEPARTMENT

1 JANUARY 1940 TO 1 OCTOBER 1945  
VOLUME III  
CIVILIAN HEALTH PROBLEMS

EDITOR IN CHIEF

WESLEY C. COX —  
COLONEL, MEDICAL CORPS  
DEPARTMENT SURGEON



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## CHAPTER 18

### EXTRA-MILITARY SANITATION AND LIAISON ACTIVITIES

(U.S.P.H.S.)

The Panama Canal Department was expanded territorially during the World War II Period, 1 January 1940 to 1 October 1945. Prior to the declaration of the Emergency the Department was limited territorially to the Panama Canal Zone and to certain areas in the Republic of Panama occupied with the consent of that Republic for reasons of mutual defense.

Under the provisions of the Treaty between the United States and the Republic of Panama, the Chief Health Officer of The Panama Canal is responsible for the sanitation and health of the terminal cities of Panama and Colon. The control of health and sanitation in these cities is under the direction of two deputies of the Chief Health Officer of The Panama Canal who are designated respectively, the Health Officers of the City of Colon and the Health Officers of the City of Panama. These officers, who are employees of the United States government perform all the normal duties and functions of a City Health Officer including many functions and duties usually assigned to the City Welfare Department in cities of the United States. These welfare functions include the collection of garbage and trash, street-cleaning, inspection of plumbing housing and building activities, etc.

Hospitalization is under the supervision of these Health Officers, the government hospitals in the terminal cities being National Hospitals under the supervision of the President of the Republic.

The Minister of Hygiene, Social Welfare and Public Works is in charge of all health and sanitary activities in the Republic of Panama. The Director of Health, usually a physician functions directly under the Minister and is charged with the supervision of all health and sanitary activities outside of the terminal cities of Colon and Panama. This officer supervises all of the Provincial hospitals, the Unidades Sanitaria, the malaria control units, the tuberculosis clinics, the school nurses, the visiting nurses and the various Municipal water works.

There is close cooperation between the Chief Health Officer of The Panama Canal as Director of Health of the terminal cities of Colon and Panama, the Health Officers of the cities of Colon and Panama, the Minister of Hygiene of the Republic of Panama and the Director of Health of the Republic.

There are no United States Public Health Service Officers assigned to duty in the Republic of Panama. One officer of that service is assigned to the Staff of the Governor of The Panama Canal as Chief Quarantine Officer and assistant in this capacity to the Chief Health Officer, The Panama Canal. This officer under direction of the Chief Health Officer and the regulations promulgated by the Congress of the United States and the Governor of The Panama Canal supervises all quarantine activities, including the granting of pratique to all vessels stopping at or transiting The Panama Canal, together with the quarantine control of passengers and crews of these vessels and of all air craft entering The Panama Canal Zone.

The Department Surgeon and his commissioned assistants cooperated fully with the Chief Health Officer of The Panama Canal, the Health Officers of the terminal cities of Panama and Colon, the Minister of Hygiene of the Republic of Panama, the Director of Health of that Republic and the respective Provincial Health Officers. The most excellent cooperation was afforded the Department Surgeon by these Health Officers.

The control of venereal disease was greatly aided by the Chief Health Officer who established a prophylactic station adjacent to the Tivoli U.S.O. Club in Ancon, C.Z. in 1943; and a new prophylactic station adjacent to the well-known Coconut Grove district in the City of Panama; enlarged the Prophylactic Hospital for the treatment of women infected with venereal disease; provided prophylactic clinics for the regular examination of all known prostitutes; provided personnel for the investigation of all "sources of Venereal Disease Contact" reported on Med. Dept. Forms 140 and inspected all houses of prostitution.

The Department Surgeon and his commissioned assistants inspected all places in the Republic of Panama and other Central and South American Republic which were patronized by enlisted men. Through liaison with the respective health authorities the sanitation of restaurants, refreshment bars, cantinas and cabarets was maintained at a satisfactory standard. Such places not maintaining the required standards were placed "Off Limits" by the Commanding General of the Department after due notice to the local health authorities and the owners of the establishments in question.

Water supplies in all cities visited by troops were carefully inspected and regularly examined bacteriologically as were also the milk supplies. The members of the command were warned against drinking milk or water at cities or towns not listed as having potable water supplies and sources of pasteurized milk. When necessary towns and cities were placed "Off Limits" by the Commanding General of the Department after complete investigation and full negotiations with the respective health authorities.

Through liaison with the Health authorities of the respective Republics in Central and South America Malaria control activities were increased. In 1943 the Chief Health Officer of The Panama Canal obtained a fund for forwarding malaria control activities in the Republic of Panama through the office of the Coordinator of Inter-American Affairs. The Pan American Sanitary Bureau also assisted in the sanitation and malaria control activities in that Republic.

The Office of the Coordinator of Inter-American Affairs assisted greatly in the development of malaria control projects adjacent to military installations in the Republics of Guatemala, Honduras, Nicaragua, Costa Rica and Ecuador.

One of the most important liaison activities was the most effective cooperation between the Department Surgeon's Office, the Department Quartermaster and the Office of the Coordinator of Inter-American Affairs in the development of sources of food for the military personnel of this Department. Meat, vegetables, fruits and paste products were obtained from local sources after complete sanitary inspections. This augmentation of the food supply saved shipping space and greatly improved morale. In addition it was an important factor in assisting the economy of the respective Republics.

Close liaison with the Ministers of Health of the Republics in Central and South America included in the Panama Canal Department was maintained by the Department Surgeon. Visits were exchanged and most cordial relations established on the basis of mutual understanding of the problems at hand and the ability to conduct these conferences in the language of the country, Spanish.

The Chief Health Officer, The Panama Canal was instrumental in having Lieutenant Colonel O. C. Wenger, Senior Surgeon, U. S. Public Health Service, Division of Venereal Disease, assigned to his office in the fall of 1943. Colonel Wenger made a survey of the venereal disease situation and made many excellent suggestions.

In summarizing the liaison activities during the World War II Period it may be said that the excellent results obtained reflect the close relationship and cooperation maintained throughout this period by the military and civilian health authorities.



## CHAPTER 19

### OCCUPATIONAL HEALTH

With the advent of the emergency it became necessary to employ large numbers of Gold (white) and Silver (colored) civilians as skilled, semi-skilled and unskilled civilian employees of the Army in order that the necessary construction might go forward as rapidly as possible.

In addition to the civilian employees of the Army there were thousands of Gold (white) and Silver (colored) workers employed by the contractors who had obtained Government contracts.

The possibilities of the introduction of communicable diseases and of tropical diseases was foreseen.

In order to assure the employment of healthy individuals the securing of Silver (colored or native) labor was placed under the direction of the Panama Canal Civilian Employment Section. The Chief Health Officer of The Panama Canal developed examining teams who visited the Republics of Central and South America and the Islands of the West Indies where labor was obtainable and conducted physical examinations upon all applicants for employment. Only those applicants who were free of all clinical symptoms of communicable and tropical diseases and who met the minimum physical standards were shipped to the Canal Zone. Upon arrival here chest plates and serological tests were performed. All newly employed individuals were immunized against small-pox and typhoid fever.

Camps for civilian employees of the Army and the contractors were established. Sanitary regulations for these camps were published. Memorandum No. 110, Hq. Panama Canal Department, dated 27 August 1940, subject Sanitary Regulations for Contractors' Camps and Construction Areas, Constructing Quartermaster, Panama Canal Department was published for the information and guidance of all concerned. Copy of this Memorandum is attached as Exhibit "A".

Sanitary inspections were regularly made of all civilian employees' camps. Mess sanitation was maintained at a high standard. Regular monthly physical examinations were conducted. A set of Sanitary Regulations was published by the Division Engineer, Panama Division, in October 1942. These regulations were enforced at all Engineer camps. Copy of these regulations is attached hereto as Exhibit "B".

The occupational health of all employees remained good. There were no explosive epidemics during the World War II Period.

Malaria, venereal disease and the respiratory infections were the chief cause of admission. Intestinal infections were very low. There were a few cases of the common communicable diseases, but no epidemics or endemics.

First-aid stations were established at each camp. Sick Call was held daily. All cases requiring hospitalization were promptly hospitalized.

MEMORANDUM )  
: )  
No. 110 )

HEADQUARTERS, PANAMA CANAL DEPARTMENT,  
Quarry Heights, Canal Zone.  
August 27, 1940

SANITARY REGULATIONS FOR CONTRACTORS CAMPS AND CONSTRUCTION  
AREAS, CONSTRUCTING QUARTERMASTER, PANAMA CANAL DEPARTMENT.

1. General.-

The forty series of Army Regulations and Regulations, Panama Canal Department, 1939, pertaining to the preservation of health, prevention of disease and the direction and execution of public health measures shall be considered an integral part of these regulations.

2. Responsibility for sanitation of Construction Camps, C.Q.M.-

(a) The Constructing Quartermaster is responsible for the general sanitation of the camp sites and all installations therein.

(b) Post Commanders will contact the Constructing Quartermaster direct with regard to any defects or deficiencies in the sanitation of Contractor Camps and/or Constructing Quartermaster Construction Areas at their respective posts with which they are unable to correct locally.

(1) Commissaries, dispensaries and recreational facilities at Construction Camps will be operated by an agency of the United States. The Constructing Quartermaster shall be responsible for the sanitation of these facilities.

(2) The contractor shall be responsible, under the supervision of the Constructing Quartermaster, for the sanitation and general cleanliness of the barracks, bunk houses, kitchens, mess halls, wash rooms, latrines, shower rooms and other buildings.

(3) The camp surgeon shall be responsible for the sanitation and cleanliness of the camp dispensary.

(4) In the event that a surgeon is not assigned to a Construction Camp or in the absence of the surgeon, the first aid man shall be responsible for the sanitation and cleanliness of the camp dispensary.

(c) Sanitary Inspections.-

(1) The Medical Department is responsible for investigating and making recommendations concerning the preservation of health, prevention of disease and the direction and execution of public health measures.

(2) The Construction Camp Surgeon shall make a daily sanitary inspection of all camp kitchens, mess halls, barracks, bunk rooms, recreation rooms, wash rooms, latrines and shower rooms. He shall make a general sanitary inspection of the Construction Camp area at least once each week.

(3) The Construction Camp surgeon shall make verbal recommendations to the responsible camp official for the correction of sanitary defects and wherever practicable shall supervise the methods employed for the correction of these defects. He shall make a written report of any sanitary defects the correction of which he is unable to accomplish locally. This report shall be made in duplicate, one copy being forwarded to the Constructing Quartermaster, and one copy to the Department Surgeon, Quarry Heights.

(d) The Surgeon of each Post at which Contractor's Construction Camps and/or Constructing Quartermaster Construction Areas are located, shall make a sanitary report covering such projects to the Post Commander each month. One copy of each monthly informal sanitary report shall be sent to the Department Surgeon and one copy to the Constructing Quartermaster.

(e) The Chief Health Officer may make such inspections of any dispensaries operated by the Health Department, the Panama Canal, as may be required and such inspections of the Construction Camps as may be required in order to determine whether the terms of the contract entered into with the laborers recruited in foreign countries and Puerto Rico relative to sanitation, hygiene and public health are being met.

(f) The Department Field Sanitary Inspectors under the direction of the Department Surgeon, shall make recommendations for mosquito control and shall supervise the construction of such mosquito control installations as may be required.

3. Water.-

Only water piped from the filtered water mains of the Canal Zone Water supply will be used for drinking, cooking, bathing or toilet purposes. When water from any other source is used for construction purposes, the outlets will be plainly marked in English and Spanish: DO NOT DRINK, UNFIT FOR HUMAN CONSUMPTION.

4. Food.-

(a) Non-perishable food shall be stored in screened, ventilated storerooms.

(b) Perishable foods shall be stored in an ice box or refrigerator and shall be constantly kept at a temperature below fifty degrees F.

(c) All food shall be prepared only in the officially designated kitchen and scullery areas.

(d) Left overs will not be served.

(e) No food of any kind will be introduced into the barracks or bunk houses of any camp.

5. Food Handlers.-

(a) All cooks, assistant cooks, butchers, waiters, kitchen police or other employees, who regularly handle, prepare or serve food or drinks, shall be examined by the camp surgeon or other officially designated medical agency, prior to employment and at monthly intervals thereafter to determine the existence of active, clinical manifestations of any disease which would render the employee unfit to handle or prepare food. The examination to include questions as to the history of diarrhoea or intestinal disease.

(b) Any cook, assistant cook, butcher, waiter, kitchen police or other employee who regularly handles, prepares or serves food or drinks and who leaves the kitchen or mess hall for any purpose whatsoever, shall thoroughly wash his hands with soap and water and clean his nails upon re-entering the kitchen or mess hall.

(c) A lavatory provided with running hot water and cold water shall be installed in each kitchen. This lavatory shall be constantly equipped with soap, paper towels, a clean and efficient nail brush and a nail file.

(d) Clean white clothing shall be worn by all cooks, assistant cooks, butchers and waiters.

6. Dish and Utensil Washing.-

All eating and cooking utensils shall be thoroughly washed in hot soapy water and rinsed as follows:

(a) Eating Utensils: Shall be covered with clean water, temperature not less than 175 degrees F. and held at this temperature for two (2) minutes.

(b) Tables: Shall be thoroughly scrubbed after each meal with a mixture of lye water and soap.

(c) Cooking Utensils: Shall be rinsed with clean water, temperature not less than 175 degrees F. for not less than two (2) minutes.

(d) The use of common drinking glasses, cups, canteens or other utensils is forbidden.

7. Garbage and Refuse.-

(a) All kitchen garbage and refuse shall be placed in standard G.I. garbage cans equipped with tight fitting tops.

(b) All refuse from bunk houses and recreation rooms shall be placed in standard G.I. cans equipped with tight fitting tops.

(c) All garbage and refuse cans shall be removed and emptied daily.

(d) All G.I. cans used for garbage or mixed garbage and refuse shall be washed daily with hot water and soap.

(e) The disposal of garbage and refuse at each camp shall be as follows:

(1) Fort Sherman Camp.-

(a) Mixed garbage and refuse from kitchens and mess halls shall be collected by employees of the Constructing Quartermaster and delivered to the Post incinerator, Fort Sherman, for disposal. Wood for firing the incinerator shall be furnished by the Constructing Quartermaster in such quantities as required to properly incinerate this garbage and refuse.

(b) The refuse and trash from bunk houses, recreation rooms, offices, latrines and the general camp area shall be transported by employees of the Constructing Quartermaster to the dump, Fort Sherman.

(c) The Constructing Quartermaster will furnish such labor as is required to properly police the incinerator area and dump area used in the disposal of camp garbage, refuse and trash.

(2) Albrook Field Camp.-

(a) Mixed garbage and refuse from kitchens and mess halls and refuse and trash from the other camp facilities shall be transported in tightly covered G.I. cans by employees of the Constructing Quartermaster to a suitable location on the pick up route of the Canal Zone garbage and refuse truck. The filled cans shall be brought to this location not more than one hour prior to the arrival of the Canal Zone garbage and refuse truck and shall be removed immediately after emptying by this service.

(b) Heavy items not suitable for disposal, as set forth in 7. (e) (2) (a) above, shall be transported to the Albrook Field dump by employees of the Constructing Quartermaster and disposed of by burning. Labor for this purpose and the necessary police of the dump area used shall be furnished by the contractor.

(3) Fort Clayton Camp.-

(a) Mixed garbage and refuse from kitchens and mess halls and refuse and trash from other camp facilities shall be disposed of by incineration on an open rack or grid type incinerator, constructed by the Constructing Quartermaster. All labor required to collect and incinerate garbage, refuse and trash and to police incinerator area shall be furnished by the Constructing Quartermaster.

(b) The incinerated material shall be disposed of at a sanitary dump, only the toe of which will be kept open. The completed fill shall be kept covered with earth.

(c) The incinerator at this camp shall be so located that no smoke or odor nuisances will be created at Fort Clayton or the Post of Corozal.

(4) Fort Kobbe - Howard Field Camp.-

(a) Mixed garbage and refuse from contractor kitchens and mess halls, refuse and trash from the other contractor camp facilities, mixed garbage and refuse and refuse and trash from Constructing Quartermaster civilian quarters at Howard Field shall be disposed of by incineration in an open rack or grid type incinerator constructed by the Constructing Quartermaster. All labor required to collect and incinerate garbage, refuse and trash and to police incinerator area shall be furnished by the Constructing Quartermaster.

(b) The incinerated material shall be disposed of at a sanitary dump, only the toe of which shall be kept open. The completed fill shall be kept covered with earth.

(c) The incinerator at this camp shall be so located that no smoke or odor nuisances will be created at the installations at Fort Kobbe.

(5) Fort Gulick Camp.-

(a) Mixed garbage and refuse from contractor kitchens and mess halls, refuse and trash from other contractor camp facilities, mixed garbage and refuse and refuse and trash from Constructing Quartermaster civilian quarters at Fort Gulick shall be disposed of by incineration in an open rack or grid type incinerator constructed by the Constructing Quartermaster. All labor required to collect and incinerate garbage, refuse and trash and to police incinerator area shall be furnished by the Constructing Quartermaster.

(b) The incinerated material shall be disposed of at a sanitary dump, only the toe of which shall be kept open. The completed fill shall be kept covered with earth.

(c) The incinerator at this camp shall be so located that no smoke or odor nuisances will be created at the existing military installations.

8. Kitchen Sullage.-

(a) Sanitary grease traps shall be provided for all kitchen sinks.

(b) Kitchen sullage shall be conducted away from the camp area in pipes and shall be finally disposed of in such a manner as to prevent fly breeding or other nuisances.

9. Human Excreta.-

(a) Human excreta (urine and feces) shall be disposed of by water carry sewerage.

(b) All latrines at construction camps shall be mosquito proof and screened with mosquito proof screening.

(c) Latrines at work projects distant from the construction camp shall be fly tight, deep earth privies, provided with tight seat covers which will close automatically following use. Each pit privy shall be oiled with crude oil daily.

10. Protection against Malaria.-

(a) Barracks, bunk houses, recreation rooms, kitchens, mess halls, latrines, wash rooms and shower bath rooms shall be so constructed and screened so as to render these facilities mosquito proof.

(b) The dark corners of all barracks, bunk houses, recreation rooms, kitchens, mess halls, latrines, wash rooms and shower bath rooms shall be sprayed each morning before 9:00 A.M. and each evening before 10:00 P.M. with a mixture consisting of one part Pyrocide or equivalent in 25 parts of kerosene or similar oil. The hand sprayers and insecticide spray shall be provided by the Constructing Quartermaster.

11. Contagious and Infectious Disease.-

(a) All cases of contagious and/or infectious disease shall be removed to a Canal Zone Hospital immediately upon diagnosis of such cases.

(b) The occurrence of a contagious and/or infectious disease at any camp shall be reported without delay to the Chief Health Officer, The Panama Canal, the Department Surgeon, the Panama Canal Department and the Surgeon of the Post where the camp is located.

(c) All cases of acute venereal disease shall be removed from the camp and shall not be permitted to return until all acute clinical manifestations have subsided.

12. Post Exchanges and/or Commissaries.-

(a) Post Exchanges and/or Commissaries established at any camp shall be of mosquito proof construction and shall be adequately screened.

(b) All permanent food handlers shall be examined as set forth in these regulations for cooks, etc.

13. Moving Picture Theaters.-

(a) Moving picture theaters established at any camp shall be of mosquito proof construction and shall be adequately screened.

(b) The dark corners of the theater building shall be sprayed each morning and evening before the opening of the theater with an insecticide spray consisting of one part of Pyrocide or equivalent in 25 parts of kerosene or a similar oil. Spray guns and insecticide spray shall be provided by the Constructing Quarter-master.

14. Vermin.-

(a) Frequent inspection shall be made of all beds and bunks.

(b) Mattresses and bedding shall be sunned at least once each week.

(c) If bed bugs are observed, beds and all cracks or crevices which might harbor bugs or eggs will be painted with a mixture of 10 percent creosol in kerosene.

(d) The bedding and mattress and personal clothing of any employee infested with body lice, lice or public lice shall be sterilized by the use of steam. The infested employee shall be removed from the barracks or bunk room and not permitted to return until freed of infestations. (Surg. 700)

S A N I T A R Y   R E G U L A T I O N S

DIVISION ENGINEER, PANAMA DIVISION

ANCON, CANAL ZONE



APPROVED:

/s/      George Mayo  
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Colonel, Corps of Engineers,  
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SANITARY REGULATIONS  
DIVISION ENGINEER, PANAMA DIVISION  
ANCON, CANAL ZONE

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Blueprints Attached

- No. 1 - Vegetable Rack
- 2 - Cement Garbage Rack
- 3 - Open Grid Incinerator (For Small Camps)
- 4 - Grease Trap and Soakage Pit
- 5 - Standard Box Latrine
- 6 - Standard Fly Trap

HEADQUARTERS CARIBBEAN DEFENSE COMMAND  
PANAMA ENGINEER DIVISION  
MEDICAL SECTION

Ancon, Canal Zone  
October 15, 1942

SANITARY REGULATIONS

I. GENERAL

a. Cooperation required. The application of well-established practical measures for the preservation of health and the prevention of disease is essential in order that all Engineer personnel may accomplish their respective duties efficiently. It is of the greatest importance that all Engineer employees be conversant with the basic principles of hygiene and sanitation as outlined herein. Long experience in the Panama Canal Department has shown that any group of individuals in the field is soon decimated with malarial fever, respiratory, intestinal, and skin diseases unless rigid rules of sanitation and hygiene are intelligently enforced and implicitly obeyed by all persons.

b. The forty (40) series of Army Regulations, FM 21-10, FM 8-40, Regulations, Panama Canal Department, 1940, circular letters, and Regulations, Panama Health Department, pertaining to preservation of health, prevention of disease and the direction and execution of public health measures shall be considered an integral part of these regulations.

II. RESPONSIBILITY FOR SANITATION,

a. Supervisory personnel of all grades are responsible for sanitation and for the enforcement of the provisions of these sanitary regulations within their organizations and the boundaries of areas occupied by them. Supervisory personnel will take such steps with any employee or employees as they may deem practicable and feasible to correct sanitary defects.

b. The Medical Section. The responsibilities charged to the Medical Section will be in compliance with Paragraphs 2 and 3, AR 40-205, insofar as it applies to civilians and civilian organizations, i.e., Engineer employees and Engineer camps.

### III. WATER SUPPLY.

- a. All drinking water at field positions, except that drawn from the Canal Zone water system, will be chlorinated. In emergencies, where no HTH (High-Test Hypochlorite) can be secured, drinking water will be sterilized by boiling for 5 minutes. (See Section b, Paragraph 4, below).
- b. Sterilization of drinking water in the field.
  1. Lyster bag.
    - (a) Suspend Lyster bag on a tripod or tree branch.
    - (b) If water is cloudy or muddy, let settle in suitable container for one hour and filter through cheesecloth, old clean sheet, clean flour sack, or clean burlap prior to putting water into Lyster bag.
    - (c) Fill Lyster bag to within 4 inches of the top with water. The capacity is 36 gallons.
    - (d) Dissolve thoroughly the contents of one tube of High-Test Hypochlorite into 1/4 cup of water taken from the Lyster bag. Empty this chlorine solution into bag. Rinse cup with water and pour into bag.
    - (e) Obtain a clean stick or a clean tree branch and stir the water in Lyster bag thoroughly.
    - (f) Draw one cupful of water from each faucet of Lyster bag and pour back into the bag.
    - (g) WAIT THIRTY MINUTES BY THE CLOCK after chlorine has been added to the water. The following test will next be made to determine the adequacy of the chlorine present in the water.
    - (h) Orthotolidine Test: 1/2 cup of water (about 3 oz.) is drawn from a faucet of the Lyster bag. Fifteen (15) drops (use ordinary eye-dropper) of orthotolidine solution is added to the 1/2 cup of water to be tested. Let stand for five (5) minutes. Pour enough of the water from the cup that is to be tested into an empty clean glass test tube to fill it to the top. Next, place this test tube in the test wood block and match the color of the water being tested with the standard orthotolidine test tubes which are labeled, stating amount of free chlorine present in each tube. There should be not less than 1 part per million (P.P.M.) residual chlorine present in the water tested 30 minutes after chlorine has been added. If less than 1 part per million (P.P.M.) of residual chlorine is present in the water tested 30 minutes after chlorine has been added, the entire procedure of adding another tube of chlorine must be repeated, waiting 30 minutes before again testing the chlorinated water with orthotolidine solution.

NOTE: The solution to test for chlorine in the water is obtained by submitting a request to the Chief Surgeon, Medical Section, Division Engineer, Panama Division, Box 5043, Ancon, Canal Zone.

2. Water Tank.

- (a) Two (2) large heaping tablespoonsfuls of HTH (High-Test Hypochlorite) is thoroughly mixed in one (1) gallon of water. It is allowed to settle, and the supernatant liquid is added to each 5,000 gallons of water to be chlorinated before the tank is pumped full of water, so that thorough mixing of the solution will take place.
- (b) Wait 30 minutes and test for sufficient chlorine in water as per above directions, (Orthotolidine test). If the test indicates not enough chlorine present, an additional two (2) large heaping tablespoonsfuls of HTH dissolved in one gallon of water as above will be added to each 5,000 gallons of water until 1 P.P.M. residual chlorine is obtained on adding the orthotolidine solution to the water and comparing the color of the water being tested with the orthotolidine standard color tubes.
- (c) More than 5,000 gallon capacity.
  - (1) If more than 5,000 gallons of water are used over a 24-hour period at the camp, then the chlorine solution should be prepared in sufficient quantities to last a full twenty-four (24) hour period. Example: 15,000 gallons of water used in twenty-four hours. Mix 6 heaping tablespoonsfuls of HTH (High-Test Hypochlorite) to 3 gallons of water and adjust the chlorine intake valve at the pump so that 3 gallons of chlorine solution is used for each 15,000 gallons of water.
  - (2) Until the chlorine intake pump valve is properly adjusted, several tests (orthotolidine) for residual chlorine daily should be done until the proper amount of chlorine is obtained.
  - (3) Sufficient chlorine solution made as in 2, (a) and (b) above, will be mixed each morning and a sufficient quantity to last for a 24-hour period placed in a clay crock (5 or 10 gallon size) or glass jug.

3. Individual Water Chlorination.

- (a) One ampule of HTH (Calcium Hypochlorite) is dissolved in 4 oz. of water to make a stock solution. This stock solution should be kept in a screw-top, airtight, light-proof glass bottle. The bottle may be made light-proof

by wrapping in black or other dark colored paper or painting with black paint. Fifteen (15) drops of this stock solution added to one quart of water will render the water suitable for drinking. One teaspoonful of stock solution will chlorinate one gallon of water. Two (2) tablespoonfuls of stock solution will chlorinate 5 gallons of water. REMEMBER - ALWAYS WAIT THIRTY MINUTES AFTER ADDING CHLORINE TO WATER BEFORE DRINKING.

4. Boiling.

(a) Water that has been boiled for five (5) minutes is considered suitable for drinking. (When boiling water, the five-minute waiting period should be started when the water actually starts to bubble.)

5. Use of Iodine for Emergency Purification of Individual Drinking Water.

(a) In the absence of Calcium Hypochlorite, Tincture of Iodine (3 1/2%) may be used as a temporary expedient. Six (6) drops of Tincture of Iodine will purify 1 canteenful (1 quart) of water. Thirty minutes should be allowed before the water is used. This method is to be used as an emergency method only.

6. Bulk chlorination of water will be inaugurated at each field position only after a visit there by a medical officer and his detailed prescription of quantities and methods to be used in chlorinating and in testing results of same.

7. Chlorine in Containers.

(a) Whenever a small 5 lb. can of High-Test Calcium Hypochlorite is opened at any position, the contents of the can will be transferred at once to a glass jar with a screw top having a washer that insures an airtight closure, because exposure to air causes a more rapid liberation of chlorine gas leaving less chlorine available for the chlorination of water. Mayonnaise jars are suitable. Lacking such jars, any airtight container may be used.

(b) All containers of chlorine will be stored in a dark place, and if of glass, the glass should be made light-proof by painting black on the outside.

(c) When a 100 lb. can of High-Test Calcium Hypochlorite or Perchloron is opened, the lid must be replaced tightly and immediately or the chlorine content of the powder will decrease rapidly and become ineffective.

8. In the construction of water mains, wells, filters, storage tanks, and other units of a water supply system, such units should be thoroughly treated with chlorine before the system is put into use. The dosage of chlorine necessary for each installation will be in accordance with Technical Bulletin #8, Panama Engineer District, Office of the Outlying Area, Albrook Field, Canal Zone, dated April 24, 1942, Subject: "Water Sterilization."
9. It is the responsibility of all medical aid attendants to supervise and check that when drinking water is chlorinated as directed above, that the water is potable by testing with orthotolidine solution and the proper amount of residual chlorine (1.P.P.M.) is present in the water 1/2 hour after chlorine has been added.

c. When Water Is To Be Collected.

1. Bacteriological examination of specimens of drinking water will be collected from all Engineer camps once each month, as a routine matter. Such examinations will be made at more frequent intervals when requested by medical officers on duty with the Division Engineer.
2. Who will collect water sample? The specimens of water will, when practicable, be collected by a medical officer and in any case by a medical aid attendant. If the water to be examined is delivered through pipes or is pumped from a well or cistern, the local supply pipe and all pump connections will be emptied by allowing the water to run 15 minutes before taking the sample.
3. Labeling and Preparing Specimen Bottles:
  - (a) The water sample is shipped to the Ancon Laboratory, Ancon, Canal Zone direct, or sent not later than 6 hours after taking sample, to the Chief Surgeon, Medical Section, Division Engineer, Panama Division, Ancon, Canal Zone, who will forward the water sample to the Ancon Laboratory, Ancon, Canal Zone.
  - (b) The following information will accompany each sample of water, which will be clearly labeled:
    - (1) Date and time of collection.
    - (2) Place: (Example, Camp Jones, faucet, kitchen, Lyster bag; chlorinated or not chlorinated).
    - (3) Method of Shipment: (Boat, airplane, messenger, etc.).
    - (4) Nature of Specimen: (Bacteriological examination of water).

- (5) General topography of the land.
- (6) If water is from a well, the depth of the well, strata found in digging or boring and whether well is sealed or not.

4. Collection and Shipment of Water for Bacteriological Examination;  
Technique of Collecting Water Samples: Specimens of water for bacteriological examination will be collected in sterile bottles furnished for the purpose by the Chief Surgeon, Medical Section, Division Engineer, Panama Division. In taking specimens from a faucet or a pump, a small, gentle stream will be allowed to flow, the stopper taken out, the bottle grasped near the bottom, held in upright position, and the stream permitted to flow into the bottle until it is filled to the shoulder. The lip of the bottle will not be brought into contact with the faucet or spout, nor will the neck of the bottle or naked part of the stopper be permitted to come in contact with any object during the manipulation. When well water is to be examined the bottle will be filled directly from the bucket constantly in use for drawing the water, and from no other vessel. The stopper and the cloth covering will be secured by carrying the wire (or string) several times around the neck of the bottle and twisting or tying the ends of the string.

#### IV. FOOD AND MESSES.

a. Attendants. Paragraph 60, P.C.D. Regulations, 1940 will be strictly complied with in reference to examination of civilians, including civilian food handlers. Extract of Paragraph 60, P.C.D. Regulations, 1940, is as follows:

1. All food handlers will be examined once each month by a medical officer or doctor of the Division Engineer. Paragraph 12, AR 40-205 will govern in defining "Food handlers," and in examining them.
2. Prior to employment, all food handlers will be examined by a medical officer of the Division Engineer for evidence of communicable disease. All San Blas Indians and other natives will have blood smears for malarial study. In addition, all San Blas Indians and other natives will be examined twice yearly, in May and December, to determine if they are "carriers" of malaria. A report of the results of these blood examinations will be forwarded to the Department Surgeon.

3. Recent changes in Paragraph 60 c (1), P.C.D. Regulations, with reference to stool examinations of food handlers PRIOR TO EMPLOYMENT is quoted and will be strictly complied with at all times:

"In ordinary cases without histories of intestinal diseases or upsets only one stool sample will be sent to the Board of Health Laboratory. If, however, the case does have a history of recent intestinal upsets, diarrhea, etc., or the case is in any way suspicious, three stool specimens, as indicated in the above-quoted regulations, will be sent to the Laboratory in each case. Three specimens will also be sent in any suspicious case or when investigation is being made for suspected disease carriers among the employees."

4. Stool specimens will be collected in special paper containers furnished on request by the Chief Surgeon, Medical Section, Division Engineer, Panama Division, Ancon, Canal Zone, and forwarded immediately to the Medical Officer in Charge of Tivoli Medical Infirmary, Division Engineer, Ancon, Canal Zone, who will prepare the stool specimens for shipment to the Ancon Laboratory to determine the presence of organisms of the typhoid, paratyphoid-dysentery group.

5. Where kitchen help is hired locally near a camp the requirements of Section a, Paragraphs 3 and 4, above, will be strictly complied with, except that stool specimens will be forwarded to the medical aid station of the camp and the medical attendant will prepare the stool specimens for shipment to the Surgeon, Tivoli Infirmary, according to instructions contained in Memorandum No. 9, Office of the Surgeon, District Engineer, Isthmian District, dated July 28, 1942.

6. Paragraph 60 (e) P.C.D. Regulations, 1940, with respect to vaccination against smallpox will be applied to all civilians who are residents of the Canal Zone or employed by the Division Engineer. This regulation reads: "Every person living in the Canal Zone who has not been successfully vaccinated within five (5) years, or who has not had an attack of smallpox (which facts shall be determined by the Chief Health Officer) shall submit to vaccination to the satisfaction of that officer unless, in his opinion, the person is not a fit subject for vaccination; and it shall be the duty of every person having the care, custody, or control of any minor or other individual to be properly and effectively vaccinated."

7. All food handlers on duty in a mess will have his or her medical certificates posted in the mess hall, indicating him (her) to be free of communicable disease. These certificates will have spaces thereon for the signature of the examining medical officer, indicating that the food handler was examined at the end of the current month and found free of communicable disease. A Wassermann blood test will be done on any food handler when in the opinion of the examining medical officer it is indicated.
8. Miscellaneous - Food Handlers.
  - (a) All food handlers will wear a shirt, cook's cap, and white clean apron while on duty.
  - (b) Fingernails will be cut short.
  - (c) The hands will be washed immediately after visiting the latrine. Convenient facilities will be provided in each kitchen for washing the hands. This lavatory shall be constantly equipped with soap, paper towels, a clean and efficient nail brush, and a nail file. In addition to washing the hands in soap and water, rinsing in a 2% solution of creosol is a valuable precaution.
  - (d) Any food handler suffering from head or chest colds, diarrhea (loose bowels) or skin diseases will be immediately relieved from duty by the mess steward and sent to the nearest Division Engineer medical infirmary for examination and treatment.

b. Diet

1. The adequacy of the diet served is impaired by many improper practices, such as long storage of fresh foods, over-soaking before cooking, overcooking, discarding cooking water, and preparation too long before food is served. These practices result in loss of nutritive value and reduced palatability of food.
2. The continued absence of accessory substances (vitamins) from food will lead to the occurrence of definite deficiency diseases, such as scurvy and beri-beri. The following rules will help prevent the development of these diseases:
  - (a) When rice is used as the chief constituent of a dietary, an under-milled grade should be provided, if available. Beans, peas, or other legumes should be used at least once a week.

- (b) If practicable, some fresh fruit should be issued at least once or preferably twice a week. Canned tomatoes are a useful substitute in the absence of fresh fruit.
- (c) White potatoes and fresh meat should be served at least once a week and preferably daily.
- (d) Extensive use of canned goods is forbidden when other foods are available.

### c. Food Supplies

#### 1. Meats and Fish

##### (a) Source

- (1) Only meats obtained from authorized agencies will be served. Authorized agencies are those agencies approved by The Panama Canal Health Department or by the Chief Surgeon, Medical Section, Division Engineer, Panama Division.
- (2) Only fish purchased through authorized agencies will be used because poisoning from eating spoiled fish has been reported occurring in the tropics.

##### (b) Quality

- (1) All meats and fish will be inspected by the mess steward to insure proper quality and freedom from contamination and spoilage. No food which appears suspicious of contamination or spoilage will be served.

##### (c) Handling

- (1) Every precaution will be taken to prevent contamination of meats and fish by food handlers, dirty utensils, flies and dust during the process of preparation and serving.

- (2) A suitable device for handling beef consists of a clean bag of stout canvas, large enough to hold a quarter of beef and provided with a draw string for closing. The bag is slipped over the quarter as it hangs in the store, closed, and not opened until it reaches the kitchen. Fresh meats which are found on receipt at a kitchen to present any sanitary defect should be brought to the attention of the proper medical officer. Slight contaminations, bruises, mold, etc., should be trimmed off and the surface cleansed with plain water by wiping or scrubbing. The meat should then be cut up at once and put away in the refrigerator, ordinarily to be cooked and served the same day.

- (3) Fresh meat shipped by boat to the Outlying Area camps will be kept in a refrigerator at a temperature of 32 degrees Fahrenheit or lower.

(d) Storage

- (1) Fresh meats should preferably be used the same day obtained and ordinarily not kept more than 24 hours before serving.
- (2) The ice box or refrigerator should be constantly kept at a temperature below 45 degrees Fahrenheit.
- (3) Fresh meat will be hung from hooks in such a manner that there is sufficient air space between the pieces, and between the meat and walls, ceiling or floor of the box.
- (4) Coverings and wrappings should be removed to hasten chilling process.
- (5) Food compartments should not be overcrowded.
- (6) A good thermometer should be provided for each refrigerator.
- (7) Frozen meats will be defrosted and then promptly boiled, fried, or roasted.
- (8) All meats will be thoroughly cooked before serving.
- (9) Pork will be served only after the cut surfaces of the meat have been cooked to a "white color."
- (10) Lard will be stored in wood or metal containers in the refrigerator.
- (11) Bacon grease and suet grease will be continually used for not more than 24 hours. Rancid grease will not be used.
- (12) Oysters will not be served raw. Oysters will be served only in the form of oyster stew which has been thoroughly boiled. Oysters which appear in any way to be spoiled will not be served.
- (13) Cured meat such as bacon and ham will be stored in refrigerators. Good air circulation and freedom from dampness are essential in order to prevent the formation of mold or slime. Removal of paper covering is not necessary. Mold and slime will be removed daily if necessary by washing or wiping the surface with a dilute vinegar or soda solution. Each piece should hang free from contact with another piece or with the wall of the box. If crated, the crates should be stored so as to permit the circulation of air around each crate.
- (14) Frankfurters should not ordinarily be stored for over 24 hours before being used.
- (15) Deteriorated poultry will not be served. Poultry will be immediately cleaned and insides removed. The carcasses will be soaked in salt water overnight and kept in the refrigerator.
- (16) Sausages are very perishable. They will be kept in refrigerators in original containers. Only frozen sausages will be used. They will be served only after thorough cooking, preferably within 24 hours after receipt. They will be placed in refrigerators immediately upon being received in the kitchen.

(17) No hash prepared from left-over meals will be served.

(18) Storage of left-over foods should be reduced to a minimum.  
Cooked foods should not be kept longer than 24 hours in a refrigerator before serving. Cooked left-over foods will be thoroughly recooked before being served.

(19) Sandwiches - The use of ground meats and egg or cheese spreads as sandwich fillers is dangerous unless prepared just prior to serving. Sandwiches to be issued to employees in the field for future consumption should be generally of non-protein foods unless adequate amounts of ground pickle mixture containing vinegar are used as a filler with them. They should be prepared as close as possible to the time of consumption. Sandwiches made of jelly, jam, butter, sliced cheese, and sliced meat, providing that no mayonnaise or other cooked dressing is used and the meat and cheese are covered on both sides with a ground pickle mixture containing vinegar, are suggested types to serve.

## 2. Milk and Dairy Products and Acid Drinks

(a) Milk

- (1) Only Grade A pasteurized milk, canned milk, or powdered milk will be served.
- (2) Milk will not be purchased in bulk.
- (3) Fresh milk will be immediately placed in refrigerators after delivery to the mess.
- (4) Canned milk will be used immediately after being opened.  
The opened milk can will not be stored in the refrigerator. Any milk remaining in the can will be poured into a clean porcelain milk pitcher or cup and stored in the ice box for later use.
- (5) Diluted canned milk will not be used for more than one meal.

(b) Butter will be purchased from approved sources only.  
Approved sources are those which are approved by The Panama Canal Health Department or by the Surgeon, Panama Canal Department. Butter will be kept in the refrigerator. It should not be stored in the same place or close to odorous substances, such as fish, cheese, or onions.

(c) Eggs which show evidence of being unsound on inspection or on breaking will be rejected and not used.

(d) Acid Drinks or Foods

- (1) The use of metal containers for the storage of cooked foods even in efficient refrigerators is dangerous.  
China or glass containers will be used to the greatest possible extent for such storage. Metal containers should never be used for storage of cooked food other than in refrigerators. NO metal container will in any case be used for the storage of any cooked fruits, fruit juices, or other foods with an acid content.

(2) Lemonade, orange juice, or limeade will not be prepared or served in G.I. cans because of danger of zinc poisoning.

### 3. Fruits and Vegetables

- (a) No locally grown fruits or vegetables which cannot be skinned or peeled will be served without thorough cooking. Vegetables will be purchased only from authorized sources, which are those approved by The Panama Canal Health Department or by the Surgeon, Panama Canal Department.
- (b) No fruits or vegetables which appear suspicious of contamination or spoilage will be served.
- (c) Salads - No salads prepared from left-over meals will be served.
- (d) Vegetable bins
  - (1) Potatoes and onions will be stored in screened vegetable bins, to prevent insects and mice from entering the bins. (See Print No. 1, attached).
  - (2) The vegetables should be rotated in the vegetable bin so that the older vegetables \*(potatoes and onions) are used first.
  - (3) Inspection of vegetable bins and removal of any spoiled vegetables should be done daily.

### 4. Canned Foods

- (a) No canned foods showing leaking, swelling, or springing will be used as food. If canned food on opening has a spoiled odor or looks discolored, throw it away where even animals cannot get it. Do not even taste it because if infected with Bacillus Botulinus, one taste may kill you.

### 5. Bread and Bakery Products

- (a) Bread and pastries will be protected from insects, such as flies, roaches, and from dust and dirt.
- (b) Bread and pastries will be stored in screened bread cabinets or in the ice box after being well wrapped in paper or placed in paper bags.
- (c) Bread will be transported to the messes in boxes having lids. These boxes will be cleaned before placing bread in box prior to delivery.
- (d) Bread boxes will be scrubbed daily with soap and hot water. No bread box should be used after cleaning as above until thoroughly dry.
- (e) Free circulation of air between loaves in screened bread cabinets will help prevent formation of mold.

- (f) The doors and screening must be tight on bread and pastry boxes to prevent insects, i.e., cockroaches, from breeding inside bread boxes.
- (g) Pastries and bread purchased from unauthorized sources is prohibited.

#### 66. Food Storage - Refrigerators

- (a) The interior of refrigerators or ice boxes should be kept scrupulously clean and free from odors. The interior of the food compartments should be scrubbed at least once weekly.
- (b) Ordinary refrigerator temperature shall be below 45 degrees Fahrenheit at all times.
- (c) Foods as fish, cheese, or bananas, produce odors which may be stored in close proximity to such foods as milk or butter.
- (d) Drip pans should be provided underneath meat racks to catch drip blood and juices from fresh meat. They should be cleaned daily with soap and water.
- (e) Pressed meat (salami, etc.) should be loosely stored in trays in the refrigerator and not placed directly on the built-in wood racks in the refrigerator.

#### 7. Store Rooms

- (a) All foods, especially sacked beans, coffee, sugar, etc., will be stored at least 2 feet off the floor on wooden platforms.
- (b) Cartons and wooden boxes should be neatly stacked.
- (c) Opened spaghetti boxes or cartons should be stored in large G.I. cans.
- (d) Stored goods should be arranged in storeroom so that the floor may be scrubbed easily at least once weekly.
- (e) Storerooms shall be screened and well ventilated.
- (f) Where facilities are available, all fruits and vegetables should be stored in a cooling room in bins or racks.
- (g) Bananas should be suspended from the ceiling.
- (h) Plantains should be stored neatly on shelves.
- (i) Sugar, flour, rice, oatmeal, and similar articles should be placed in large G. I. Cans after the original package or sack has been opened.

8. Pantries

- (a) Pantries should be large enough to store dishes without overcrowding.
- (b) Shelves should be scrubbed daily.
- (c) Dish cabinets shall be screened and the doors should fit tightly so that roaches cannot enter therein.

9. Food Preparation and Serving

- (a) Every precaution should be taken to prevent contamination by food handlers, dirty utensils, flies, and dust during the process of preparation and serving.
- (b) Food Handling - The use of left-over food should be reduced to a minimum. Protein foods and salads, such as potato or egg, should not be prepared more than 4 hours prior to serving. Such foods, unless hot, should be kept in shallow pans in the refrigerator until the time for serving. Sliced cooked meats, ground meats, ground cheese, ground boiled eggs, and peeled boiled eggs, coming in intimate contact with the hands of kitchen help, should be prepared just before cooking and serving. The placing of this type of food in deep containers in refrigerators is dangerous. Due to the slowness of heat loss, the center of the mass does not quickly reach refrigerator temperature and it affords ideal conditions for rapid increase of bacteria.
- (c) Every effort should be made to avoid preparing excess quantities of food, as left-over foods cause wastage, show poor mess management, and are dangerous.

10. Dish and Utensil Washing - All eating and cooking utensils should be thoroughly washed in hot soapy water and rinsed as follows:

- (a) Eating utensils shall be covered with clean water, temperature not less than 175 degrees Fahrenheit and held at this temperature for two (2) minutes.
- (b) Cooking utensils shall be rinsed with clear water, temperature not less than 175 degrees Fahrenheit for not less than two (2) minutes.
- (c) Tables shall be thoroughly scrubbed after each meal with a mixture of lye water and soap. Table tops should have a removable middle board so that the corners may be readily cleaned with a knife or other sharp instrument. The table supports and benches should be scrubbed once daily.
- (d) The use of the common drinking glass, cup, canteen, or other utensil, is forbidden.
- (e) Dish towels will not be used. All dishes and utensils will be air dried.

- (f) Meatcutters, meat saws, wooden handles of knives, etc., will be kept scrupulously clean and free from odors and particles of food in order to prevent bacterial growth which may cause food poisoning.
- (g) All unsanitary utensils should be disposed of and replaced by new ones.
- (h) Rinsing of Bottles
  - (1) All bottles should be thoroughly rinsed immediately upon being emptied. This applies to bottles used in messes and to soda and beer bottles used at Post Exchanges.
  - (2) All empty bottles should be disposed of as soon as possible and not left lying about Post Exchanges or grounds.

## V. WASTE DISPOSAL

### a. Garbage - Solid Wastes

1. (a) Garbage is of importance as a factor in the transmission of disease, chiefly because it provides food for house flies and serves to attract them in large numbers to the vicinity.  
(b) Flies are definitely known to be the agent in transmitting many serious intestinal diseases of which the most common are typhoid, cholera, dysentery and many types of diarrhea.
2. Garbage will be collected in standard galvanized iron (G.I.) cans equipped with tight fitting metal lids. Garbage cans, the racks on which they stand and the surrounding ground will be kept scrupulously clean. Soil which becomes soiled or soaked with food particles or with liquid wastes from garbage will under tropical conditions provide a breeding place for flies. (See copy of Blue Print #2, attached, for construction detail of garbage rack).
3. The ground around the garbage cans will be sprayed heavily at weekly intervals or more often with oil and firmly tamped to prevent fly breeding.
4. At the outlying camps all garbage, both edible and inedible, will be burned in the camp incinerator immediately after each meal. (See #3, Incinerator Print, attached). Tin cans will be burned in the incinerator, flattened, and buried in a pit 4 feet square and 4 feet deep. When the pit is filled to within 2 feet of the top it will be filled in with dirt and a new pit dug.

5. Garbage cans after being emptied will be cleaned with hot water and lye or hot soapy water by thoroughly scrubbing on the inside and outside, in order to remove all organic matter that would, if allowed to remain, decompose, causing odors and attracting flies.
6. Garbage can lids will be kept on cans at all times when not in use and the lids must fit tightly. The garbage platform will be scrubbed daily with a stiff scrubbing brush and hot soapy water. The ground around the stand will be sprayed at weekly intervals or more often with oil or waste oil and firmly tamped. Every effort should be made to avoid spilling particles of food around the garbage racks. This area should be constantly policed.

b. Disposal of Waste Water

1. All liquid waste, including water used to wash dishes, mess kits, and kitchen utensils should pass through a grease trap before being disposed of in soakage pits (sumps), septic tanks, sewers, or poured into the lake or ocean. Care should be taken that the ground around soakage pits is not contaminated by greasy water or food particles.
2. Liquid kitchen wastes in amounts not in excess of 200 gallons per day, are best disposed of by a soakage pit. The soakage pit is a hole 4 feet deep and 4 feet square filled with broken rock, varying in size from about 3 inches in diameter at the bottom of the pit to 1 inch at the top. Tin cans or broken bottles may be substituted for the broken rock. A grease trap is necessary in conjunction with a soakage pit as grease, if not removed from the liquid waste, will soon clog the soakage pit. (See #4, print attached). Two or more such pits should be constructed for each kitchen. A daily rest period of several hours will increase the efficiency of soakage pits. The two (2) or more soakage pits should be used on alternate days. When possible, each soakage pit should be given a rest period of 1 week every month. If, in spite of these precautions, the pit becomes clogged with organic material, the application of 5 gallons of 10% solution of either calcium hypochlorite (Perchloron powder) or caustic soda (lye) may clear it.

3. Shower water should pass through a grease trap but may by-pass the septic tank. In no case will the waste water from kitchens by-pass the grease trap.
  - c. Grease Traps - Grease traps work best if two grease traps are connected in series.
    1. Cool water is the effective agent in grease traps; usually the water in the second trap is sufficiently cooled to permit rapid rising of the grease.
    2. Lack of constant care makes grease traps a nuisance and a menace to health. Flies breed on the walls and baffles, and bacteria decomposing certain of the contents of neglected traps cause foul odors.
    3. Each grease trap will be skimmed daily. The skimmings will be burned in the incinerator or placed in garbage cans. Extreme care will be used to see that the skimmings are not dropped on the ground at any point during the operation. If any are dropped, the earth on which they fall will be entirely recovered and put in the incinerator or buried. All tools used in the skimming operations will be thoroughly cleaned. This may well be performed over the grease trap.
    4. Each grease trap will be chlorinated daily when necessary to eliminate odors and only when necessary for this purpose. This will be accomplished by dissolving two large heaping tablespoonfuls of H. T. H. (High Test Calcium Hypochlorite) in one-half gallon of water. This solution will be poured down the kitchen sink drain into the grease trap as the last operation in the kitchen at night.
    5. The entire grease trap will be thoroughly scrubbed with hot soapy water down to the top of the liquid daily. Solid matter on the bottom of the trap will be cleaned out with a shovel once every one or two weeks. The solid matter will be disposed of in the incinerator or buried. The brushes, brooms, or shovels used for this purpose will be thoroughly washed. Care will be taken in handling solid matter and in cleaning all tools and receptacles similar to that prescribed above for skimmings.

d. Septic Tanks

1. Septic tanks provide for sedimentation and storage of suspended solids until anaerobic decomposition, or septic action, has effected a reduction in the volume of the retained organic material.
2. A portion of the solids will settle out as sludge on the bottom of the tank, while the floating material forms a scum. Anaerobic decomposition occurs in both the sludge and the scum, producing disintegration and liquefaction of the organic material with the formation of gasses and reduction in the volume of the solid constituents. As the gas is released from the sludge on the bottom of the tank, it carries the lighter particles of organic matter upwards and increases the thickness of the scum layer. The scum may form a thick, hard, compact mass. The effluent as it leaves the tank is capable of producing nuisances and may contain pathogenic organisms.
33. When the scum layer of floating material on the surface is over 3 inches thick, it will be broken up daily and pushed to the bottom of the tank with a strongly built T-ended pole until the surface scum thickness is 3 inches or less. This will permit the escape of gasses and cause heavier decomposing materials, which give rise to odors, to be deposited as sludge on the bottom of the tank.
4. Whenever the scum layer becomes offensive, tough, and three inches or more in thickness, one may alkalinize the contents of the tank by pouring into the tank a solution made by dissolving two pounds of quick lime in ten gallons of water after the heat of the slackening has cooled off. Continue this treatment daily until the scum is reduced to less than three inches in thickness.
5. The longer a septic tank is in operation the more efficient it is in septic action, providing the scum layer is less than 3 inches thick and the sludge on the bottom does not fill up more than twenty-five percent of the tank. Some tanks are slow in starting septic action. In these cases, tanks built for 100 men camps will be primed by adding two cubic yards of manure, fifty percent fresh and fifty percent compost. The smaller tanks require two bushels of manure, fifty percent fresh and fifty percent compost.

6. No sludge will be removed from septic tanks until it interferes with the operation of the tank. Sludge will be reduced as soon as solids begin to be present in the effluent or it is estimated that twenty-five percent of the volume below the water line is composed of solid material. The sludge will be pushed to the lowest end of the tank and pumped out with a suitable hand pump furnished by the Division Engineer on request. In order to continue the septic action of the tank a third of the sludge will be left in the tank as a primer. The sludge pumped out will be buried in the ground immediately. Sludge from septic tanks generally need not be reduced more often than once every 6 months to one (1) year.
7. Pumps, pails, receptacles, and other equipment used for breaking up scum and for removal of sludge will be thoroughly cleaned with hot soapy water. Extreme care will be taken to see that septic material is not dropped on the ground at any point during the operation. If any is dropped, the earth on which it falls will be entirely recovered and put in the incinerator.
8. To reduce odors and to prevent contamination of water in streams, the effluent from septic tanks just before it empties into the stream will be chlorinated when especially ordered by the inspecting medical officer. This is done when streams are too small to properly dilute the effluent from septic tanks. Proper dilution of effluent is 1 gallon of effluent diluted in 50 gallons of water in the stream. The size of the chlorinating chamber will depend upon the size of the septic tank in use at the position. Septic tanks for camps of 150 to 200 men require a chlorinating chamber four feet by four feet by ten feet. The septic tanks at camps of 50 to 75 men require chlorinating chambers three feet by five feet by five feet. Baffle boards extending from the bottom of the chlorinating chambers to above the surface of the water, set vertically at one foot intervals, and extending from alternate sides three quarters across the chamber, will be installed between inlet and outlet pipes to insure more thorough and longer periods of chlorination. Contact period here of effluent and chlorine must be 30 minutes to properly treat all the effluent from septic tank before it enters the stream.

9. Each camp installing a chlorinating chamber for treating the effluent from septic tanks, will procure a five gallon pickle barrel and paint the inside with tar. A one inch lead pipe, one foot in length will be securely placed in the bottom of the barrel. The outside end will be compressed to an opening small enough to permit H.T.H. solution in the barrel to drip into the chlorinating chamber at the rate of 420 drops, approximately one ounce, per minute. The chlorinating solution will be prepared by dissolving H.T.H. in five gallons of water in the following amounts: 28 large heaping tablespoonfuls for the camps of 150 to 200 men; 16 for the camps of 50 to 75 men.
10. A platform for the pickle barrel will be constructed above the chlorinating chamber. The chlorinating chamber will be covered and the chlorine solution from the lead pipe in the pickle barrel will drop or be led into the top of the chlorinating chamber above the inlet of the chamber. These pickle barrels will be filled each morning.

e. Earth Pit Latrines

1. Construction of earth pit latrine
  - (a) Sufficient seat holes to accommodate 5% of the employees of the camp should be provided.
  - (b) The depth of the latrine pit to be dug is estimated as follows: Allow 1 foot of depth for each week latrine is to be in use, plus 2 feet for covering latrine over with dirt when fecal matter is within 2 feet of the ground level. Thus camp of 100 men for one month will need 5 seat holes and a pit 6 feet deep and 10 feet long. Latrine pits should never be dug over 10 feet deep. If water or rock is reached before the proper depth (not over 10 feet) is obtained, the latrine pits must be made more shallow.
2. All earth latrines should be fly-proofed as follows: An area 4 feet wide surrounding the pit is excavated to a depth of 6 inches. This area is then soaked with oil or waste oil. The earth is replaced, tamped down, and more oil added. If oil is not obtainable, the earth may be hardened by moistening with water and tamping. Earth should be tightly packed around the edges of the box to seal all openings to the pit. (See print #5 attached).

3. All latrines must be screened if not inclosed in buildings.

4. Yeast treatment of pit latrines

(a) General - The yeast (*Saccharomyces*) treatment of pit latrines possesses the following advantages:

- (1) Prevents pollution of ground water by overgrowing and destroying pathogenic organisms.
- (2) Attacks carbohydrates and cellulose, thus destroying and digesting organic matter with resultant liquefaction of the fecal mass which is more readily absorbed into the soil.
- (3) Toilet paper is reduced to a fluid pulp and is digested by bacteria which attack cellulose.
- (4) The usual latrine odors are greatly reduced.

(b) Amount of yeast solution required and time of treatment.  
Pit latrines should be yeast treated continuously. Two quarts of yeast-sugar solution should be added to each latrine hole (seat) twice each week. For example in the treatment of a four (4) seat (hole) pit latrine a total of eight (8) quarts of yeast-sugar solution should be added on Tuesday and Friday of each week.

(c) Use of additional water in arid climates. Pit latrines at camps in arid climates must be treated daily by adding two quarts of water to each latrine hole (seat). This will provide sufficient moisture for continued action of the yeast. (DO NOT USE SEA WATER).

(d) Yeast Treatment of Pit Latrines - When dry, activated yeast is available, the following procedure should be employed:

- (1) Preparation of Sugar Solution:
  - (a) One teaspoonful of molasses, or corn syrup, or granulated sugar.
  - (b) One-fourth (1/4) teaspoonful of table salt.
  - (c) Add (a) and (b) above to one quart of water. Stir.
- (2) Preparation of Yeast Solution:
  - (a) One teaspoonful dry, activated yeast or two heaping teaspoonsfuls of wet yeast added to one quart of sugar solution made as above. Let stand at room temperature (at least 85 degrees Fahrenheit) for 36 hours.
- (3) Preparation of Yeast-Sugar Mixture:
  - (a) Add two (2) ounces of the yeast solution, 36 hours old, prepared as in (2) above, to two (2) quarts of sugar solution, prepared as in (1) above, for each latrine seat hole. (Multiply by number of latrine seat holes to obtain number of quarts yeast sugar mixture to be made up). This mixture is called

"Yeast-Sugar Mixture." Let this yeast-sugar mixture stand for eighteen (18) hours at room temperature (at least 85 degrees Fahrenheit). Then pour two (2) quarts of this mixture into each seat hole on Tuesday and Friday of each week.

(e) Reserve Yeast-Sugar Mixture:

- (1) One quart of the yeast-sugar mixture made as in (3) above is poured into a sterile bottle, stoppered with cotton, and placed in the ice box. This is to be used as the reserve yeast-sugar mixture.
- (2) For each pit latrine seat hole to be treated, use two ounces of this reserve yeast-sugar mixture and add it to two quarts of sugar solution, let stand for 18 hours, and pour into each pit latrine seat hole.
- (3) A new reserve yeast-sugar mixture should be prepared each month or sooner by starting with dry activated yeast, as in (d), (1), (2), and (3) above in order to keep the working yeast culture reasonably pure.

5. Fly Larvae

- (a) Yeast treatment does not kill fly larvae. It is necessary, therefore, that the box seats of all pit latrines at semi-permanent and permanent camps be fly-tight, be provided with automatically closing seat lids, and have a fly trap installed at each end of the latrine box so that any flies emerging may be trapped. (See print #6 of fly trap, attached).
- (b) An inverted V-slit one inch wide tapering to 1 1/2 inches wide, inside the box, should be cut in each end of the latrine box and a fly trap installed so that this opening opens into the outer portion or lower portion of the fly trap. Flies emerging from the pit will be attracted by the light and enter the trap. The bottom of the fly trap here should fit flush against the top of the pit box over the inverted V-slit. (See print #6 of fly trap slot on standard latrine box).

6. Yeast treated latrines should not be treated with crude oil, creosote, lime, or other chemicals. If water is impounded in a latrine pit and there is danger of mosquito breeding, the surface of the impounded water should be treated with a few drops of kerosene which will kill mosquito larvae without interfering with the activity of the yeast treatment.

7. Dry activated yeast for the yeast treatment of latrines should be requested by camp stewards at the same time and in the same manner that they request for food subsistence supplies.

8. The latrine box will be thoroughly scrubbed daily with soap and hot water.

- (a) The lids will be kept closed at all times.
- (b) The pit latrine floor will be cleaned and swept out daily.
- (c) In permanent buildings all latrine and bath house floors will be scrubbed daily.
- (d) The urine troughs will be scrubbed daily with soap and hot water.
- (e) An ample supply of toilet paper should be made available at all times.
- (f) If water carriage system of sewage disposal is used, the camp steward is responsible that flush boxes and toilets are maintained in working order at all times.

9. Closing Earth Latrines - Deep pit latrines should be closed when filled to within 2 feet of the ground surface. The box should be removed; the pit contents well-sprayed with crude oil or waste oil and covered with burlap or tar paper (if available) and the pit filled with dirt domed 12 to 18 inches above the surface. The site should be placarded with the date of closure and the name of the organization. The same spot should not be used for at least 1 year.

f. Fly Control

1. House and Latrine Flies

- (a) Importance. Flies, especially the ordinary house fly, frequently transmit intestinal diseases. This transmission is accomplished in a mechanical manner. If the fly has access to human excreta it collects small amounts of excreta on its legs and body and in its digestive tract. If it later has access to food or eating utensils, some of the excreta is deposited on the food by defecation, regurgitation, and contact of food with the legs and body of the fly.

2. Habits and Characteristics of the Fly

- (a) Flies pass through the following stages: egg, larval, pupal, and adult stages, each stage requiring certain definite environmental conditions for their development.

- (b) Eggs are oval, white, and average about one millimeter in length. The eggs are deposited in cracks and crevices of moist organic material. Eggs hatch in about eight hours at a temperature of 85 to 90 degrees Fahrenheit. Average time to hatch in Panama is twelve hours.
- (c) Larvae (maggots) mature in about five days.
- (d) Pupae - Pupae are immobile, hardened forms, dark in color and average six millimeters in length. Pupa stage lasts from three to ten days in this climate, depending upon environment.

3. Adult flies. When the adult fly emerges from the puparium it crawls upward through the loose soil, straw, manure, grease or other materials in which it has been hatched to the surface. As soon as the wings become dry and are hardened it is ready to fly.

4. Flies are capable of transporting, either within the alimentary tract or on the external surfaces of their bodies, any of the pathogenic bacteria that cause intestinal diseases to man, such as typhoid fever, paratyphoid fever, common diarrhea, bacillary, and amoebic dysenteries, intestinal worms, etc.

5. Breeding Places.

- (a) Breeding places must provide moisture, warmth and food for the larvae. The temperature must be less than 115 degrees Fahrenheit (this is why manure is composted in tightly packed piles, since heat generated under such conditions is sufficient to destroy fly larvae). Moisture must be present in sufficient amounts to promote fermentation. The breeding material must be alkaline, as small amounts of acid will inhibit the development of the larvae.
- (b) The house fly will breed in a variety of fermenting vegetable wastes, but selects by preference loosely packed or small accumulations of fresh horse manure. Next in importance to horse manure as breeding materials, and other factors being equal, in the order named, are human excreta, the excreta produced by dogs, cats, and other pets around camps, garbage and other organic waste such as decaying vegetables and fruits. Frequently, rubbish dumps contain organic wastes which afford breeding material for flies. The liquid wastes spilled on the

ground around wash racks, garbage cans, incinerators, etc., ferment and convert the soil into a breeding place for flies. Small deposits or masses of excreta, human or animal, or of vegetable waste lying on the surface of the ground, if the proper amount of moisture is present, will furnish breeding places for large numbers of flies.

- (c) The blue and green bottle-fly breeds normally in fresh and decayed flesh while the large black blow-fly breeds in human and animal wastes and garbage.

6. Care must therefore be exercised to eliminate breeding places. A few of these are listed as they have been found to be favorable breeding places for the flies around camps:

- (a) Latrines not properly constructed or flyproofed.
- (b) Moist soil around dishwashing racks or where dish water has been thrown on the ground instead of in soakage sumps.
- (c) Around baffle boards of grease traps not completely submerged therein.
- (d) Animal excreta.
- (e) Effluents from carry-overs from sumps (pits) and septic tanks.

7. Control will be exercised by first eliminating possible breeding places and then by use of fly traps, fly paper, and fly swatters.

## VI. SHOWERS.

a. There should be at least 4 shower heads for every 100 men living in the camp, and hot water where possible.

### b. Temporary Camps (2 weeks)

1. In small temporary camps where the employees will not remain longer than two weeks, a Lyster bag suspended from a scaffold on a tree limb is recommended. One faucet of the bag is replaced by a rubber tube, in the end of which is placed a short section of pipe closed at one end and perforated in numerous places to act as a shower head. A stone-filled soakage pit (same type as grease soakage pit, see print) should be constructed underneath the shower, being covered with boards spaced 2 inches apart on which the men stand.

### c.. Showers in Permanent Barracks - Permanent barracks should have:

1. Cement floor shower rooms with a central drain which leads through a grease trap into the second septic tank or into a stream.

2. Two sets of duckboards should always be used. One set should be thoroughly scrubbed and sunned for one day and then the second set should be scrubbed and sunned for one day.
3. The shower room floor should be scrubbed daily with hot water and soap.
4. Benches should be available for undressing.
5. Foot Baths - The use of the foot bath is essential in controlling the transmission of fungus infection of the feet. All bath houses should be equipped with foot baths so located that the bathers must use them when entering and leaving the shower baths. The foot bath container should be of concrete, or rubber lined, about 6 inches deep and 3 or 4 feet square.
6. Foot Bath Solution - The solution is made by adding one ounce (Two heaping tablespoonfuls) of H.T.H. (High-Test Hypochlorite), Perchloron, or Grade A Calcium Hypochlorite to 1 gallon of water. This solution should be replenished daily. The foot bath container should be emptied daily and thoroughly scrubbed with soap and water and new chlorine solution, as above, added.

## VII. HOUSING

- a. In temporary tent camps all employees will be furnished a mosquito net which is to be properly suspended over the cot by a metal T-bar or wood T-frame.
- b. As soon as possible after establishment of tent camps all employees should be housed in permanent screened barracks.
- c. Each employee should have a minimum of 40 square feet of floor space. Overcrowding, especially in the tropics, leads to epidemics of communicable diseases, chiefly of the respiratory group.
- d. Wood bunk stands where possible, should be replaced and gold medal cots alone used in barracks.
- e. Double decking should be kept at a minimum.
- f. Where metal standee bunks are used, a canvas or strip of similar material should be placed between adjacent bunks. This prevents employees from breathing into each other's faces. Employees here will sleep head to foot alternately.

g. Wood bunk stands, now in use will be well sprayed once weekly with a solution of 10% creosote in kerosene or other insecticide to prevent breeding of bedbugs.

h. Metal standee bunks will be sprayed once weekly with the above creosote kerosene solution or other insecticide. In addition, the canvas strips will be sunned weekly and washed as necessary.

i. All cots and springs will be sprayed at least once weekly with the above insecticide solutions.

j. All barracks floors and wood bunk stands will be swept daily.

k. All barracks floors will be thoroughly scrubbed with hot water and soap at least once weekly. Two (2) tablespoonfuls of creosol solution may be added to each bucket of wash water used as a disinfectant.

l. All Silver employees should suspend their clothes on overhead wires which extend from the rafters the length of the barracks. The wire should be nailed to each cross beam for added support. Clothes will not be scattered about the barracks or rafters. Clothes should be so suspended from the overhead wire so as not to interfere with ventilation.

m. All Silver employees who use a mattress should be required to hand pick their own mattresses once weekly for bedbugs and will sun their mattresses once weekly, preferably on a non-workday (Sunday), weather permitting. If bedbugs are found, they will remove all bedbugs by hand and will then apply insecticide to the mattress seams and corners with a small hand brush dipped in insecticide. This will be done weekly until no further bedbug eggs hatch.

n. All bed clothes should be changed and laundered at least once weekly.

o. All hand luggage and foot lockers should be neatly arranged under the bunks or at the foot of their bunks if space will permit.

p. All Gold employees are responsible that their room, bedding, and clothing stored in dry closets are kept clean and arranged in an orderly fashion. They are also responsible that their mattresses are inspected for presence of bedbugs at least once every 2 weeks and their cots and springs sprayed with 10% creosote in kerosene at least once every 2 weeks.

q. It is the responsibility of all employees to report any break in screening in their quarters to the camp steward for immediate repairs. Repair of screening will be given priority over all other repair work.

## VIII. PREVENTION OF DISEASE

### a. Smallpox and Typhoid, Paratyphoid Vaccinations:

1. Before any Gold or Silver Engineer employee is permitted to work, it will be the responsibility of the Personnel Branch to see that the employee has a record of immunization, indicating that he or she has received the initial smallpox and typhoid inoculations within three days after initial employment, and is to report to the nearest Engineer medical infirmary at weekly intervals in order to complete the typhoid inoculations within the time prescribed by the Division Surgeon.
2. Gold and Silver employees hired on the Isthmus to work in the Outlying Area will receive an initial physical examination from a medical officer on duty with the Division Engineer to determine his fitness for duty in the Outlying Area. Having passed the physical examination for fitness, the employee will receive the necessary initial typhoid and smallpox inoculations and proceed to the Outlying Area camp. The typhoid inoculations will be completed at the work camp by the medical aid man.
3. The District Engineers, Construction and Maintenance Districts, will notify the Chief Surgeon when work is to begin on new projects so that a medical aid man can be sent with the work crew (to consist of 10 or more men) to complete typhoid inoculations within the time prescribed by the Chief Surgeon. Where a work crew consists of less than 10 men, Paragraph 4 will apply.
4. It will be necessary for individual Engineer employees who are to report to the Outlying Area Camp as replacements to have completed all of the required vaccinations prior to reporting to Camp.
5. Smallpox, typhoid, and other inoculations are available at all Engineer infirmaries.
6. Immunization records will be made out in triplicate on completion of the vaccinations and inoculations. The original immunization record, signed by a medical officer, will be given to the employee. The first carbon copy will be filed at the infirmary where the vaccinations were given. The second carbon copy will be forwarded to the Chief Surgeon who will in turn forward it to the Personnel Branch where the information contained on the immunization record will be entered in the employee's 201 File.

b. Prevention of Malaria - All employees should become familiar with Office Order #12-42, dated July 11, 1942, Office of the Division Engineer, Panama Division, in regard to malarial preventive measures which is posted on all camp bulletin boards. Any violation of that office order should be reported by the camp stewards to the Construction or Maintenance District Engineer in writing. The Construction or Maintenance District Engineer will discharge an employee for these violations if he sees fit to do so.

c. Additional malarial preventive measures are as follows:

1. Prophylaxis

- (a) All employees living in tent camps should sleep under a mosquito net properly suspended over their bunks with a wood or metal T-frame. The net should always be in good repair.
- (b) The camp steward is responsible that a night guard or other employee appointed by him makes frequent inspections during the hours of darkness to see that all employees living in tents comply with Paragraph (a) above.
- (c) Only employees living in tents will take prophylactic quinine under the immediate supervision of the camp steward or his representative when employees report to the mess hall for the evening meal. He should see that the quinine is swallowed before he is permitted to enter the mess hall.
- (d) Routine - 3 tablets of quinine sulphate (5 grains each) at the evening meal for 5 days; rest 7 days and repeat until the employees are housed in screened barracks or removed from the unsanitized area. Quinine should be carefully conserved because replacement is difficult at this time.

2. Mosquito-Proof Barracks

- (a) Camp stewards or their representative should make weekly inspections of buildings and the areas around them to determine possible mosquito breeding places and to insure that the buildings are mosquito-proof. Particular attention should be paid to cracks around doors, the efficiency of door springs, unused key holes, ceiling ventilators, etc., that when buildings are undergoing repair the workmen leave the building sealed at the end of the day, and that printed instructions are posted on the outside of each outer door cautioning against leaving the door open. Breeding places should be oiled once weekly or reported to

the Camp Steward or to the Chief Surgeon, Medical Section, Division Engineer, Panama Division at (Tel.) Balboa 2101, Extension 119. Signs should also be posted in English and Spanish directing that all barracks doors be kept closed at all times. Night guards will check at 2-hourly intervals to see that all doors remain closed.

- (b) In order to prevent the development of mosquito larvae in fire buckets located in Division Engineer Buildings, the following larvacide should be used in all fire buckets:
  - (1) Eight (8) cc. (2 teaspoonfuls) of crude creosote added to the water in each bucket once each month.
  - (2) At monthly intervals these buckets should be emptied and thoroughly washed.
- (c) Each Division Engineer medical inspector will recommend to the camp steward a schedule for the monthly emptying and cleaning of fire buckets by the organizations or units concerned.

### 3. Use of Insecticide Spray

- (a) Barracks and similarly occupied buildings should be sprayed with insecticide each morning before police of barracks. This procedure should be continued daily throughout the year. This procedure should also be followed in the Post Exchanges.
- (b) Particular attention should be given to dark corners and underneath furniture and fixtures in spraying buildings as mosquitoes generally hide in such places during daylight hours.
- (c) Officers in charge of camps of the Division Engineer should endeavor to have on hand at all times sufficient spray and spray guns.

### 4. Individual Protective Measures

- (a) Use of Dover's Cream or other mosquito repellent cream - Dover's Cream has proven an effective mosquito and sand fly repellent, good for from two to four hours after application. A small amount of the cream, an amount equal to the size of a cherry stone, is rubbed on the skin of the face, neck, and hands. It is not necessary to use a heavy application of the cream for any excess will leak off on the clothing. This cream should be used by all men in the field positions for all duty outside screened inclosures between the hours of 6:00 P.M. and 6:30 A.M., such as guard duty, night work, and at such other times as supervisory personnel may prescribe. This cream should not be used during the day unless work is being carried on in dense, heavily shaded jungle.

- (b) Loitering outside of screened buildings between dusk and dawn is not advisable.
- (c) Members of the camp guard and individuals hunting or fishing should wear headnets, gloves, and leggins between the hours of dusk and dawn.
- (d) When the wearing of headnets and gloves is deemed by the responsible person to interfere with the full performance of duty, they may be dispensed with. However, all individuals concerned should apply Dover's Cream or a substitute to the exposed skin.
- (e) Long-sleeved shirts with collars buttoned up to the neck should be worn between 5:00 P.M. and 7 A.M. This should be strictly observed at meals in field positions where the mess tent is not screened.
- (f) Entering native settlements is prohibited unless required in the performance of duty. Consorting with natives is prohibited as most of them are carriers of malaria.
- (g) Employees should not remove their shirts or work coats while cutting heavy growths of brush or grass during the day.
- (h) Employees should not lie down under shrubbery, on low or swampy ground or in tall grass.
- (i) All Engineer employees, including San Blas Indians who have had malaria should sleep under mosquito bars for two months even though sleeping in screened buildings in order to give the fullest protection to other personnel. Mosquito bars should be carefully tucked under mattresses. Mosquito bars should be sprayed with insecticide before they are entered. All holes in them should be repaired and they should be laundered frequently.
- (j) Blood test - All personnel who have been hospitalized for malaria will, upon return to duty, continue taking under supervision, for a period of 7 days, 10 grains of quinine daily. One week following discontinuance of quinine they should be examined to determine the presence of the malaria parasites in the blood, by reporting to an Engineer medical infirmary.
- (k) Tin cans will be mashed flat before they are deposited in trash cans or pits.
- (l) Camp stewards and officers in charge should endeavor to reduce the incidence of alcoholism in their camps, as a malaria preventive measure.
- (m) Drainage ditches and breeding places - All officers and camp stewards in the field should insure that drainage ditches about the camp grounds and under Engineer buildings are kept open and that breeding places are oiled at least once weekly. A mixture of four (4) parts of oil (crude, waste, etc.) mixed with one (1) part of kerosene is an efficient mosquito larvacide.

c. Sand Flies

1. All tall grass and brush adjacent to all Engineer buildings and camps should be cut at frequent intervals since sand flies breed in tall grass and brush.
2. In locations where sand flies are exceedingly prevalent and are a severe nuisance in screened barracks, sand fly nets should be provided each individual and suspended over his cot. Where sand fly nets are not available, a small amount of Dover's mosquito repellent or a substitute should be applied to the exposed parts of the body prior to going to bed. Turning off all lights early will help keep sand flies from entering screened barracks.
3. Pure oil of citronella should not be applied to the body regularly since a skin rash (dermatitis) will result from the irritation due to the oil.
4. Some natives use pure coconut oil as a sand fly repellent. Coconut oil is made as follows: Grate the meat of a coconut and boil in a little water and strain the juices. The juice is placed in a jar in the ice box. After several hours the coconut oil will jell at the top of the jar and it is removed with a spoon and the jelled oil placed in a small ointment jar. Applying this coconut oil to exposed parts will help prevent sand flies from biting the exposed parts of the body.

d. Respiratory Diseases

1. No person with a discharge from the nose, a sore throat or a bad cough will be permitted inside of the kitchen shelter or to handle any article of food, nor will any such person be allowed to serve as attendant at a camp mess or Post Exchange while so afflicted.
2. All personnel having a nasal discharge, a sore throat, or a bad cough will sleep separately from men not so afflicted.
3. All practicable steps should be taken to see that such personnel do not mingle with persons not so afflicted more than necessary, and in no case in closed rooms or tents.
4. Common drinking cups will not be used.

5. Each day soft drink coolers will be emptied and thoroughly cleaned. When refilled two tubes of calcium hypochlorite will be dissolved in a cup of water and poured into the cooler.
6. Mess kit and dish washing water and rinsing water will be not less than 175 degrees Fahrenheit with a contact period of not less than 2 minutes. The adequacy of hot water and heating units for the washing of dishes and utensils of a camp are based on the following rule. For every 1,000 men living in a camp, 300 gallons of water at an initial temperature of 175 degrees Fahrenheit should be available with heating units sufficient to regenerate 200 gallons of water in 1 hour at 175 degrees Fahrenheit.
7. Every precaution should be taken to prevent anyone from sitting around in damp clothing. Letting the body chill lowers resistance and is responsible for the incidence of respiratory diseases.
8. Special attention should be given to insuring a varied menu liberal in the use of fruit or fruit juices (preferably tomato juice) and bulky vegetables such as leaf vegetables, carrots, beets, etc.

e. Protection Against Sunlight

1. A short daily exposure to direct sunlight is beneficial to the human body.
2. Excessive exposure of large areas of the body of those who have not become accustomed to the sun may result in serious illness and even death.
3. Officers in charge and crew foremen are responsible that persons under their control do not endanger their health by over-exposure of their unprotected bodies to sunlight.
4. All employees should take 2 salt tablets (5 grains each) in a little water for every 2 hours of arduous labor performed. This will prevent rapid depletion of salt from the body and will prevent against heat exhaustion and excessive body fatigue. Salt tablets are obtained by requisitioning from the Supply Section, Division Engineer, Panama Division.

f. Control of Skin Diseases

1. Trichophytosis (ringworm) is a contagious fungus disease variously called ringworm, dhobie itch, athletes foot, spick itch, or fungus. The infection is accompanied by intense itching and irritation which is most annoying at night. It occurs most commonly in the crotch, feet, thighs, and armpits, but may spread to the chest and abdomen. It is characterized by redness and inflamed and swollen areas. During hot weather it tends to become worse.
2. The disease is transmitted from person to person by contact, chiefly by hands, clothing, towels, or bathroom floors. The latrine or toilet seat is also a factor in its transmission. It results in great loss of man power. The object is to treat it early and thoroughly.
3. Trichophytosis is exceedingly difficult to cure. The earlier treatment is started, the more possible is its prompt cure. This skin disease is an increasingly serious problem, particularly among employees who use common dressing rooms, showers, toilets, etc., and who live and work in close proximity. Intensified by physical activity and hot weather, these infections can reach epidemic proportions almost overnight, ranging from temporary discomfort to serious disability over long periods.
4. Every employee infected with this disease will be thoroughly treated even though the infection is slight in order to eliminate him as a source of infection.
  - (a) Latrine and shower bath floors and latrine boxes and toilet seats will be scrubbed daily with hot water and soap. This will be followed by scrubbing the latrine and shower bath floors, latrine boxes and toilet seats with a solution of High-Test Hypochlorite (H.T.H.) or Perchloron, using two (2) tablespoonfuls to 1 gallon of water. All duck boards in shower baths will be cleaned daily with hot water and soap and will be sunned daily.
  - (b) Each shower bath will be equipped with a foot bath and chlorine solution as mentioned previously.

(c) Employees should take a bath daily. They should thoroughly dry their bodies with a clean towel after taking baths and pay special attention to armpits, crotch, and between toes. Foot powder should be dusted lightly over above regions after each bath and each morning before dressing. Feet should be dried with a towel last so infection from floor will not be carried to other parts of the body. In new camps not provided with showers, improvised showers using cans with holes in the bottom, Lyster bags with rubber hose and pipe as mentioned previously, or other expedients will be constructed at once.

(d) Fingernails should be kept closely trimmed and cleaned. This will reduce the spread of the disease.

(e) The exchange or common use of towels, gymnasium suits, slippers, shoes, gloves, etc., is inadvisable.

(f) Officers at camps or medical aid men where no officer is present, should inspect the employees once each week for presence of this skin infection and treatment will be given at once by the medical aid man or be sent to the infirmary depending on the severity of the case, for treatment.

5. Clean underclothes, socks, and towels daily are the best precaution against the spread of this disease from one part of the body to other parts. The number of suits of underclothes and the number of towels normally available can be provided daily only in case washing facilities for these articles are provided in each camp. GI or other soap or soap powder, hot water for washing these articles and provision for boiling them should be improvised by all responsible camp officers for all camps as rapidly as possible. Sun drying on lines, not on the ground, should be used.

g. Care of Mattresses, Pillows, Beds, and Bed Clothing - See Section VII, HOUSING, Paragraphs g., h., i., m., n., and p.

h. Rat Control Regulations - The following is a true copy of the Canal Zone Regulations to be complied with by all Division Engineer Contractors and employees concerned in the control of harborage of rats:

Balboa Heights, C. Z.  
July 8, 1942

RAT CONTROL REGULATIONS GOVERNING MAINTENANCE OF PREMISES  
OPEN STORAGE AREAS, AND CONSTRUCTION PROJECTS

1. All premises and open storage areas shall be kept clean and free from all rubbish and similar loose material that might serve as a harborage for rats. All lumber, boxes, barrels, loose iron, and similar material that may be

permitted to remain on such premises, and that may be used as a harborage by rats, shall be placed on supports and elevated not less than 2 feet from the ground, with a clear intervening space beneath to prevent harborage of rats and to permit inspection.

2. All temporary offices, sheds, or shacks incidental to construction projects shall be constructed with a clear space of not less than 2 feet above the ground. Temporary buildings with concrete floor slabs on the ground may require rat walls or other special treatment, depending on the location. The Health Department shall be consulted concerning this detail. All lumber and similar loose materials not intended for immediate use shall be piled or stored on supports not less than 2 feet above the ground. Metal containers shall be provided for the disposal of food scraps and wrappings from lunches of workmen on the project. These containers will be furnished and serviced by the agency maintaining garbage service for the district involved.

(Signed) GLEN E. EDGERTON  
Governor

#### IX. REPTILES AND INSECTS

a. The possibility of casualties due to snake bites makes it essential that all persons be familiar with this subject and the treatment thereof. Identification of the snake is necessary in order to administer the most effective treatment. If any employee or other person is bitten by a snake, try to kill it and send the head to the Surgeon with the patient. Two fang marks are an indication that a poisonous snake has just bitten the person. A pit below and in front of the snake's eyes and just behind the nostrils is characteristic of one group of venomous snakes, namely the "Pit Viper." The venomous snakes found in Panama are the Fer-De-Lance, Hog-Nosed Viper, Tree Viper, Jumping Snake, Bushmaster, Rattlesnake, Coral Snake, and Sea Snake. The Rattlesnake and Jumping Snake have not been found on the Canal Zone to date. When dealing with snakes in the Canal Zone and the Republic of Panama consider them all poisonous until proven otherwise. Snake bite treatment outfits should be available at all Engineer camps. A cheap knife or razor for cutting and a necktie or belt is all that is really necessary, however, for the emergency treatment of snakebite.

b. Insects such as scorpions, centipedes, and wasps often give very painful stings. The bites of these insects may be treated similarly to snake bites by making a cross incision 1/4 inch long and 1/4 inch deep, through the bite and by applying suction to the wound. The tourniquet may be used in case of scorpions and centipedes. Wasp stings are usually not serious. The local application of diluted ammonia solution (1 teaspoonful to 2 quarts of water), or aromatic spirits of ammonia, or a thick paste of baking soda to the bitten area will often give relief and be all that is necessary. Never apply strong ammonia to any bite because it will severely blister the skin. It is advisable in all insect bites to notify the medical aid man at once for his advice as to treatment. Leggins are a great protection in the jungle.

c. Reptiles and Insects - Do's and Don'ts

1. Don't play with snakes or insects.
2. When walking through the jungle be constantly on the alert for snakes underfoot, in the grass, bushes, and under trees and in tree branches. Keep your eyes open for snakes. Don't be careless because someone is ahead of you; a bushmaster generally will strike the last man in a column.
3. Examine your clothes and shoes for insects such as scorpions before you put them on, and look under the sheets before going to bed when in the field.
4. Don't run around barefooted.

d. First Aid Treatment of Snake Bites

1. Lay patient down on the ground.
2. Apply tourniquet (using rubber tubing out of the snakebite kit, necktie, or belt) between bite and the heart.
3. Make cross incisions through the fang marks with a sharp razor or knife which has been quickly sterilized in the flame of a match or burning paper. The incision should be about one-half inch long and one-quarter inch deep, avoiding large veins. Multiple cross incisions may be made through the swollen skin also. It is advisable that all employees carry pocket knives at outlying stations and in the jungle.

4. Use suction to suck the venom out of the wound by mouth or with the suction apparatus supplied in the snake bite treatment outfit. If you have a sore, crack, or break in the skin of your mouth, have another person suck the wound. Suction must invariably be applied to the wound since it is the most effective method of treatment. Venom can be extracted from the snake bite as late as three to seven hours after the snake has bitten a person; therefore, continue suction until a doctor arrives or until the patient reaches a hospital.
5. Do not keep tourniquet on longer than twenty minutes at a time without releasing it for one minute so blood can get into the arm or leg; otherwise, gangrene of the limb may result and the person may lose his leg or arm.
6. The medical aid man or camp foreman if no aid man is present at the time, will hospitalize as soon as possible any employee bitten by a snake. If no local hospital facilities are available, the Chief Surgeon of the Division Engineer should be notified at once by telephone (Balboa 2101, Extension 119) or radioed for his advice so that he can arrange for further treatment with anti-venom, or for transportation to a hospital, etc.
7. Carry patient to nearest transportation for evacuation to hospital. Do not let him walk.
8. Get patient to doctor as soon as possible keeping up suction continually while on the way. Know where you can get a snake-bit kit before you actually need it.
9. Don't give alcohol, beer, or whiskey to snake bite cases.

## X. VENEREAL DISEASE

- a. Venereal disease such as syphilis, gonorrhea, chancroid, and lymphogranuloma inguinale are absolutely preventable. Practically the only way these diseases are contracted is by sexual intercourse with infected women or by using another infected person's towels or drinking cup. Prostitution is the main cause of venereal disease. All prostitutes are highly infective. Avoidance of exposure to prostitutes would greatly help in stamping out venereal diseases in this department.

b. If exposed to a venereal infection, a chemical prophylaxis taken at the nearest Engineer medical aid station infirmary, or the prophylactic station in Colon or Coconut Grove in Panama City within twenty minutes after exposure will reduce the chances of contracting a venereal disease by over ninety percent. Further protection can be obtained by wearing a condom purchased at all Engineer and Army Post Exchanges, sold at a nominal price, and by washing the genital region thoroughly after exposure with soap and water. All camp stewards should insure that condoms are readily available for their men at post exchanges at all times. The cement rubber type approved condom only will be sold. Alcoholism greatly favors the contraction of venereal diseases in that it makes one forget to protect himself by use of the condom and to take a venereal prophylaxis. If a venereal disease is contracted, report the infection immediately to a doctor on duty with the Division Engineer for the necessary treatment.

c. Venereal Prophylaxis

1. All Division Engineer medical aid stations and infirmaries will establish and maintain prophylactic stations. A prophylactic station will be available to all Engineer employees in both Colon and Coconut Grove in Panama City.
2. All medical aid men at Division Engineer medical aid stations and infirmaries will give a prophylaxis to all Engineer employees who request it, at any time of day or night. A prophylaxis should never be refused to any Engineer employee.
3. All supplies necessary for administering prophylaxes will be requisitioned by the medical attendant when necessary. The request will be approved by a Division Engineer doctor, who will write a prescription for the supplies to be obtained from the pharmacy at the Engineer Corozal Infirmary and at Engineer Camp Coiner Infirmary.
4. A confidential log or daily prophylactic report sheet will be kept by all aid stations and infirmaries of all prophylaxes administered. This log or daily prophylactic report sheet will be forwarded every Saturday morning to the Chief Surgeon, Division Engineer, Panama Division, Box 5043, Ancon, Canal Zone, and written across the envelope "Personal."

5. The logs or daily prophylactic report sheets will contain the following information:
  - (a) Name of employee and I.C. number.
  - (b) Place of exposure and address and name of person if known.
  - (c) Hour and date of exposure.
  - (d) Drinking before, during, or after exposure.
  - (e) Time employee reports for prophylaxis.
  - (f) Evidence of venereal disease at time employee reports for prophylaxis.
  - (g) Signature of medical aid attendant giving the prophylaxis.
6. Engineer employees who report for prophylaxis and refuse to cooperate with medical attendants or who become abusive at any time, will be reported to the Chief Surgeon, Division Engineer, in writing, stating all facts in the case.
7. Each aid station and infirmary will have available a screen so that an employee may receive the prophylaxis in private.
8. Each medical aid attendant will have available at all times and in a locked box of sufficient size, the following articles:
  - (a) 1 pint bottle of Tr. Green Soap.
  - (b) 1 bar plain soap.
  - (c) Dark bottle of 2% protargol. This solution should be obtained fresh every 10 - 14 days and a date label placed on the bottle. Refills should be made as necessary.
  - (d) 6 prophylaxis urethral syringes sterilized by boiling in water 15 minutes, will be available at all times.
  - (e) 2 large water glasses, one filled with 1/3000 potassium permanganate solution for the storage of sterile syringes and the glass labeled "STERILE SYRINGES 1/3000 PERMANGANATE SOLUTION," and the second glass filled with soapy water for dirty syringes and the glass labeled "DIRTY SYRINGES."
  - (f) 1 lb. jar of mercurous chloride ointment.
  - (g) Toilet paper (1 roll).
9. The venereal prophylaxis technique to be followed in all instances will be according to Medical Memorandum No. 8, dated July 24, 1942, Office of the District Surgeon, Isthmian District, a copy of which will be plainly posted in all aid stations and infirmaries immediately above the prophylaxis urinal or the approved technique prescribed by the attendant at the Colon or Panama City Coconut Grove prophylaxis stations.

10. All Engineer employees availing themselves of the opportunity to receive a venereal prophylaxis will be cautioned that the method and procedure of administering a prophylaxis as outlined by Medical Memorandum No. 8 and the prescribed technique at the Colon and Panama City Coconut Grove prophylaxis stations will be strictly complied with at all times. Refusal on the part of any Engineer employee who reports for prophylaxis to comply with the approved instructions will be reported to the Chief Surgeon, Division Engineer, in writing, who will then make a report to the Executive Officer, Division Engineer, Panama Division.
11. It is the responsibility of all camp stewards in the Atlantic, Pacific, and Outlying Areas to order any employee suspected of having a venereal disease to report to the doctor at the nearest Division Engineer Medical Infirmary for examination. A letter, radiogram, or telephone report will be sent by the camp steward to the doctor at the nearest Engineer infirmary stating that the employee will report for examination for suspected venereal disease, at the stated time.

d. Treatment of Venereal Diseases

1. All venereal disease will be treated in accordance with Circular Letter No. 74, dated July 25, 1942, Office of the Surgeon General, Washington, D. C.
2. Syphilitic Treatment
  - (a) All employees ordered to receive anti-syphilitic treatment by the doctors on duty with the Division Engineer will report without fail to the Engineer Camp Coiner Infirmary on the Atlantic Side and to the Engineer Corozal Infirmary on the Pacific Side each Sunday morning at 9:00 A.M. Employees in the Outlying Area who require anti-syphilitic treatment will remain on the Isthmus in order to receive the necessary treatment. Employees requiring anti-syphilitic treatment who work in Engineer camps in the Outlying Area that are near army camps that have a medical officer on duty, will purchase the necessary medicines and report to that army medical infirmary at the time stated by the army doctor, to receive the treatment. Employees failing to do this will be reported by the army doctor to the Chief Surgeon, Division Engineer, Panama Division, Ancon, Canal Zone. A syphilitic register, Form 78, Medical Department, U. S. Army, or other approved record, will be maintained on all Engineer employees receiving anti-syphilitic treatment.

- (b) Syphilis can be cured. Any employee who suspects he has syphilis will report without delay to a Division Engineer infirmary for the necessary physical examination and tests.
- (c) It is all important that those employees under treatment for syphilis report regularly since any treatments missed will greatly decrease the patient's chances of being benefited.
- (d) Early and continuous treatment is the only method for properly treating syphilis.

#### XI. FIRST AID TREATMENT OF BURNS

a. Burns will be treated with packs of baking soda solution. This is done by covering the burned area with sterile gauze or cotton, and pouring over the gauze a mixture of one heaping tablespoonful of baking soda to a pint of water.

b. In cases of serious burns, after the soda pack has been applied, the patient should be wrapped in a blanket for transportation to the hospital.

c. Grease, lard, or butter will not be applied to burns as a first aid measure because of the danger of introducing infection and because of the difficulty and associated pain caused by removal of the grease at the hospital.

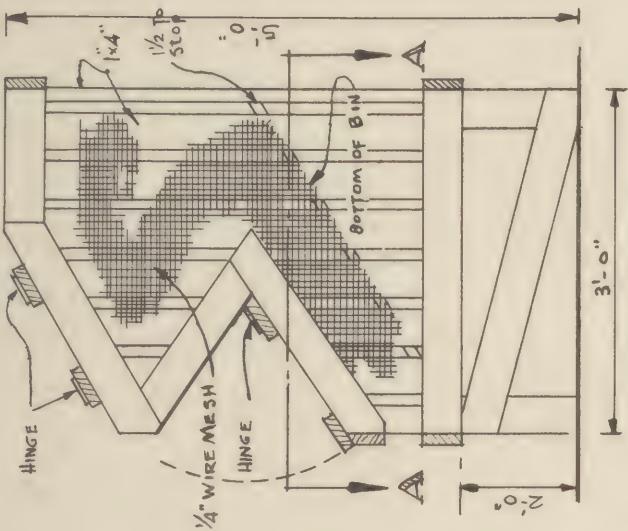
d. In all cases of burns, always treat patient for shock first.

THE END

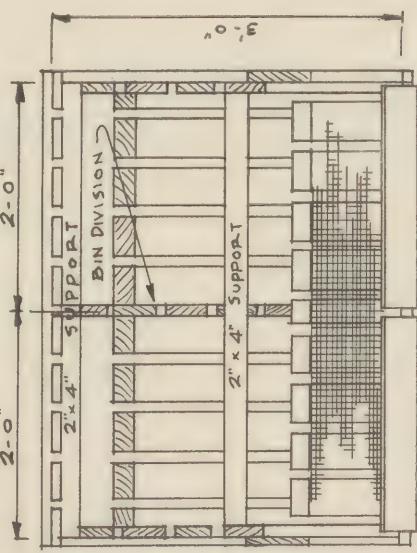
VEGETABLE RACK  
[Two Bin Type = Single Unit]

SCALE USED: 1" = 1'-0"

SIDE VIEW



FRONT VIEW.

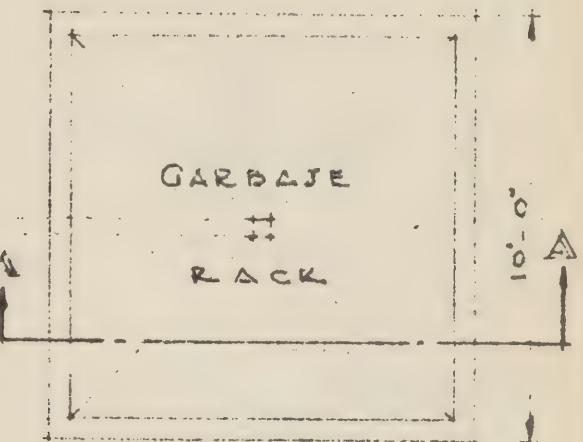


SECTION "A A"

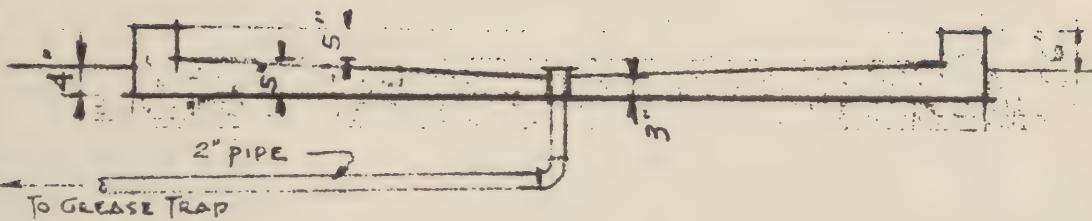


GREASE  
TRAP

GARBAGE  
RACK



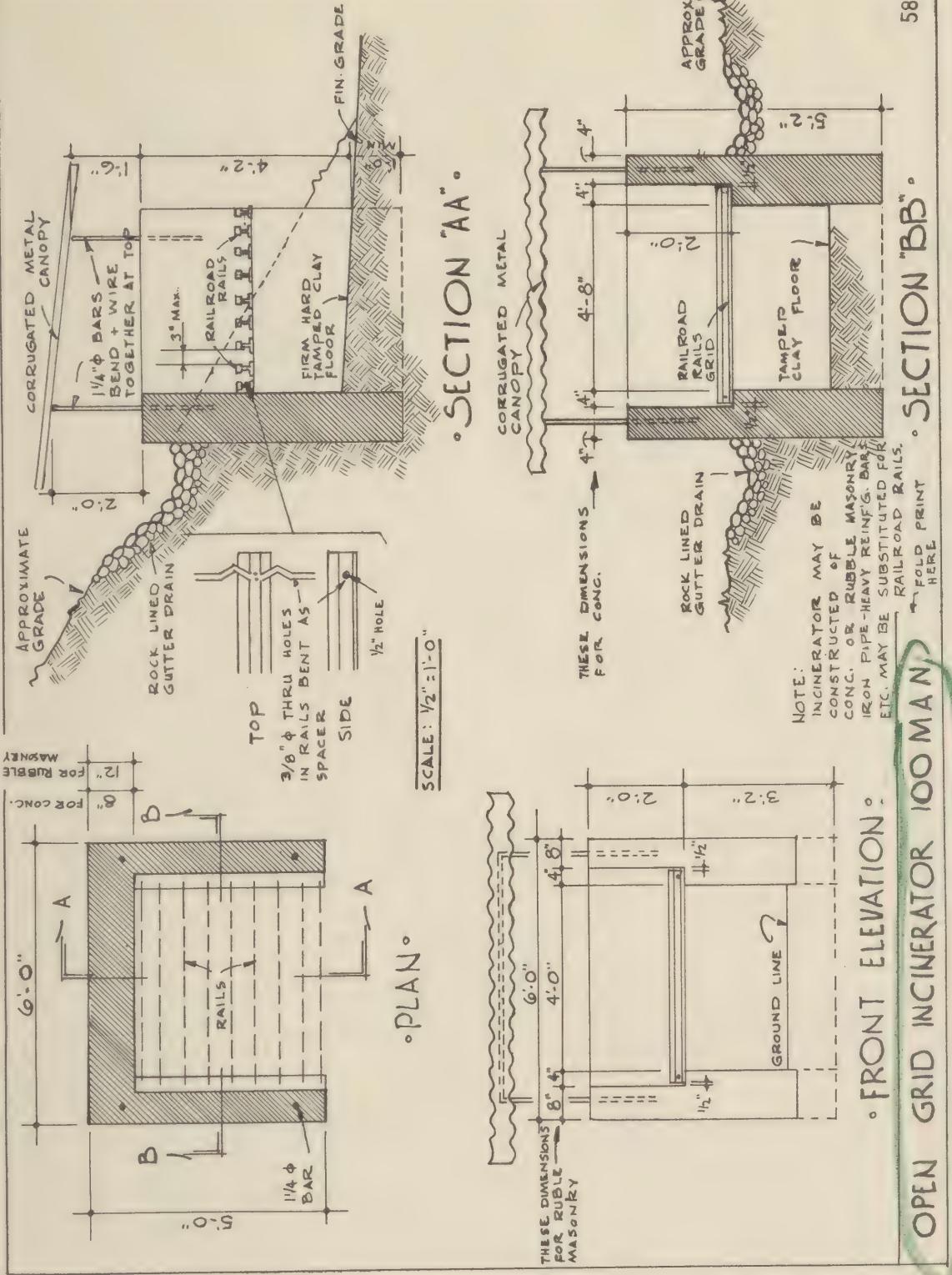
•PLAN•  
SCALE 1/4" = 1'-0"



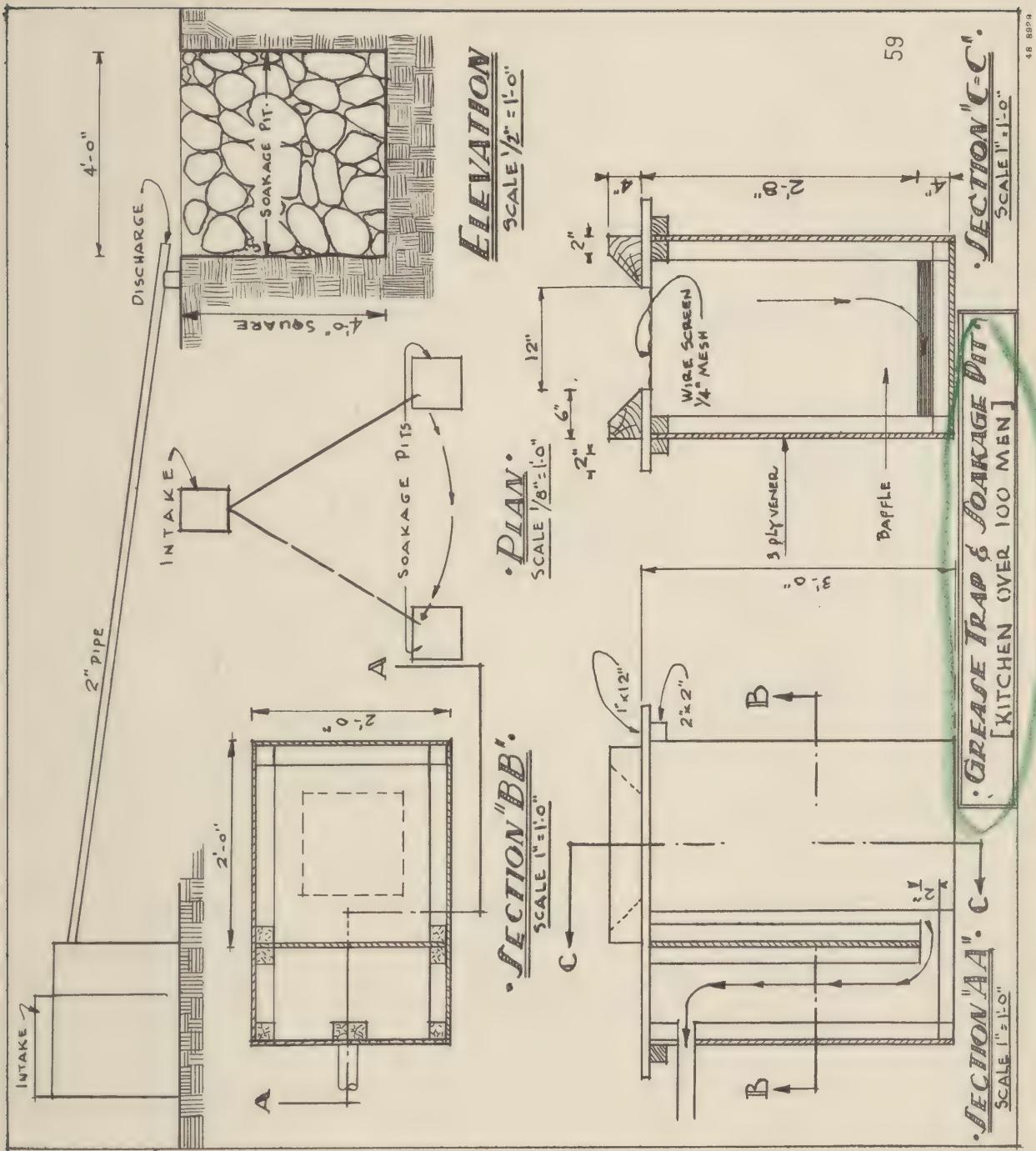
SECTION "AA"  
SCALE 1/2" = 1'-0"

•GARBAGE RACK•

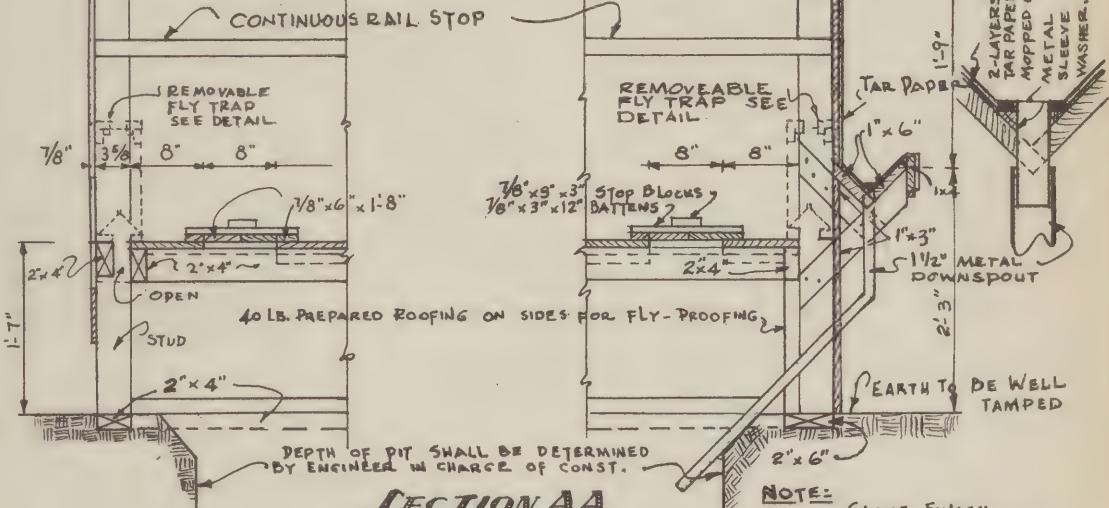








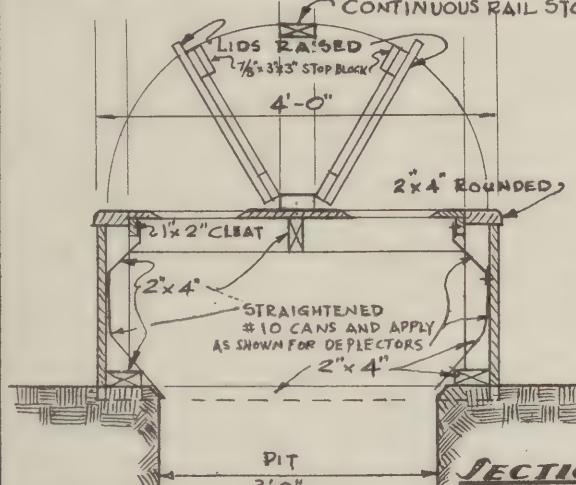




**SECTION AA**

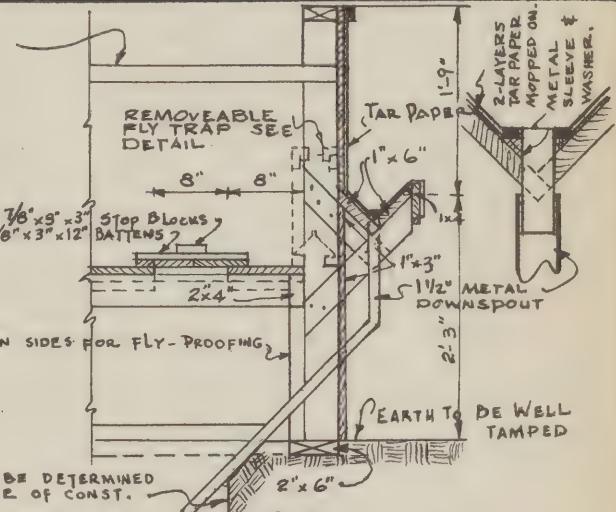
SCALE: 1" = 1'-0"

4' 1'-6" 4' 1'-6" 4' LENGTH OF FLY TRAP

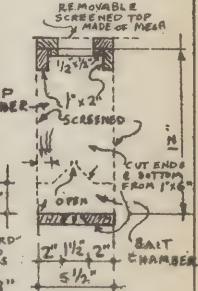
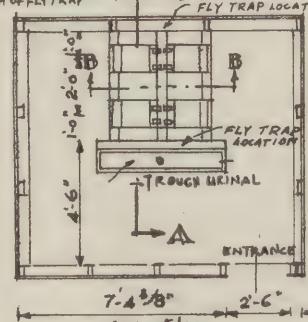


**SECTION BB**

SCALE 1" = 1'-0"



NOTE: SLOPE FINISH GRADE AWAY FROM LATRINES



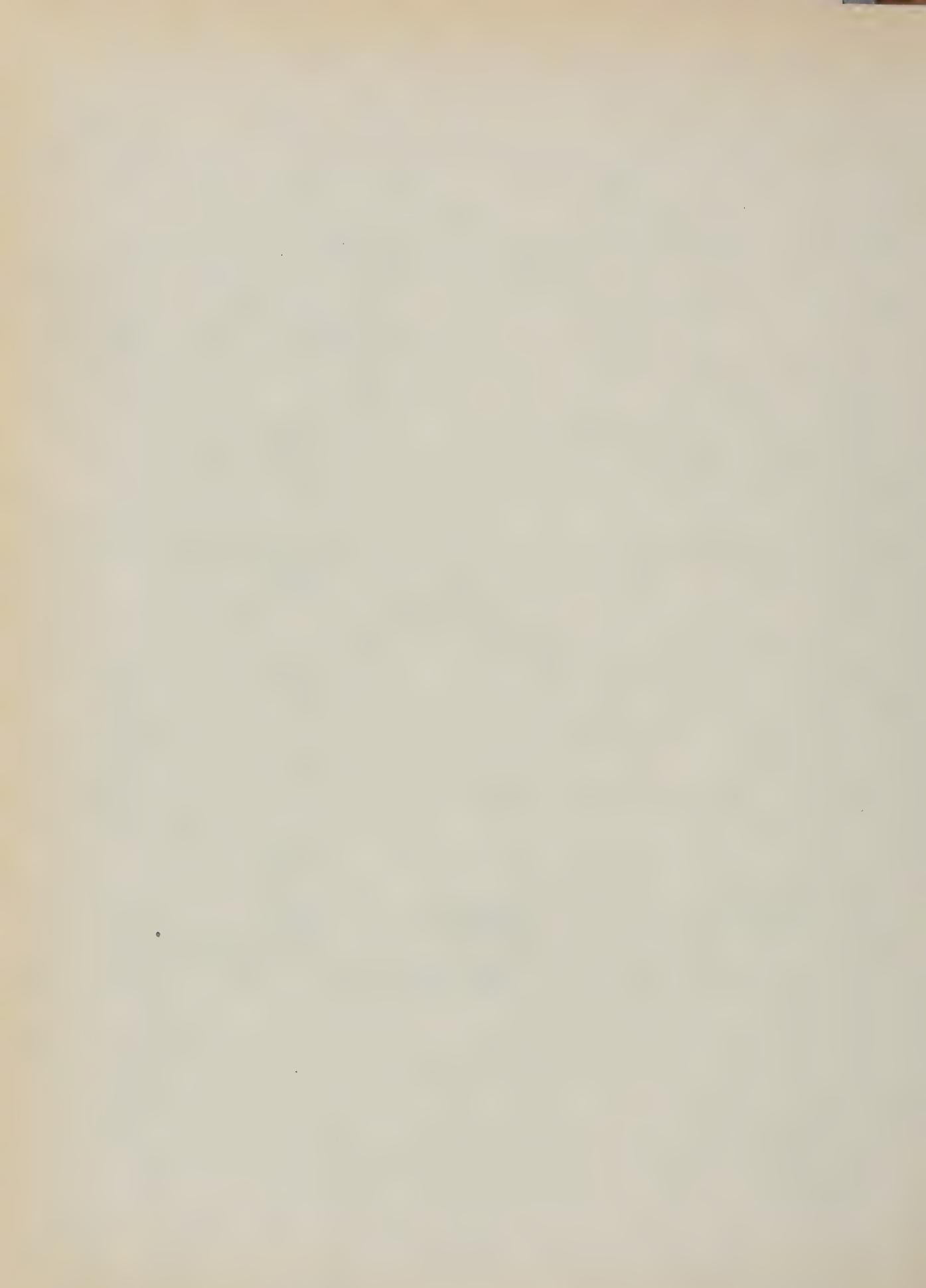
**FLY TRAP**

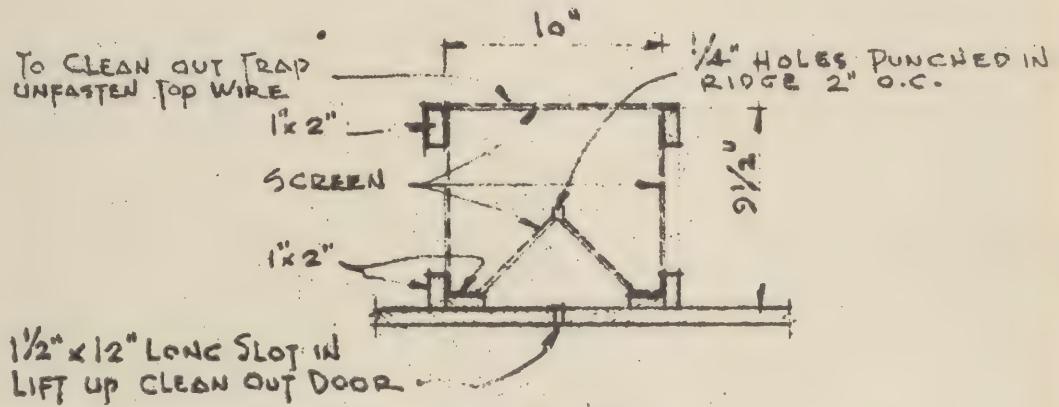
SCALE: 1/2" = 1'-0"

NOTE: FLY TRAP TO SET BETWEEN STUDS.

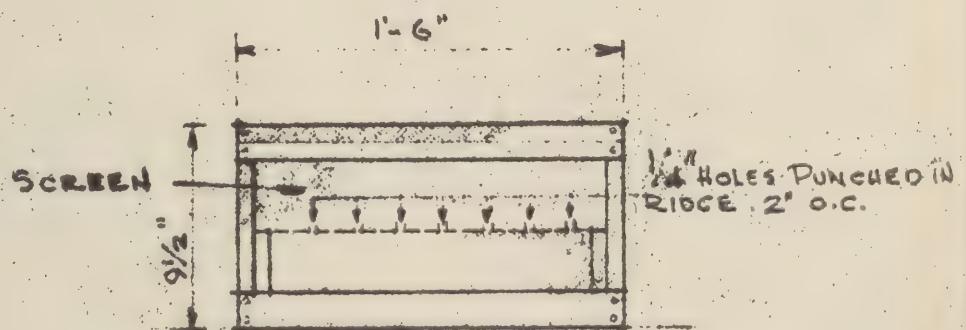
**STANDARD LATRINE**  
FOUR HOLE 50 MEN

48-11237





**SECTION**  
SCALE:  $1\frac{1}{2}": 1\text{-}0"$



**ELEVATION**  
SCALE:  $1\frac{1}{2}": 1\text{-}0"$

**STANDARD FLY TRAP**



## CHAPTER 20

### CIVIL PUBLIC HEALTH

The territorial limits of the Panama Canal Department during the World War II period embraced the Panama Canal Zone, the Republic of Panama, the Republic of Costa Rica, the Republic of Nicaragua, the Republic of Salvador, the Republic of Honduras, the Republic of Guatemala, the Republic of Ecuador, including the Galapagos Islands and the Republic of Peru. Troops were stationed at military installations in all of the above countries.

The civil public health of the Panama Canal Zone was excellent. The Chief Health Officer, an officer of the Regular Army Medical Corps, assigned to the staff of the Governor of The Panama Canal was in charge of all health, sanitary and quarantine activities which included certain activities usually included in Department of Welfare in continental cities such as garbage and trash collections and street cleaning. All of The Panama Canal hospitals and dispensaries were also under the control of the Chief Health officer.

The office of the Chief Health Officer, The Panama Canal, is organized as set forth in Chart I.

The health of the civilian communities in The Panama Canal Zone during the World War II period was excellent.

The Board of Health Laboratory, located at the Gorgas Hospital, Ancon, C.Z., functioned as the laboratory for the hospital and as the General Board of Health Laboratory for the Health Department, including all hospitals and dispensaries. This laboratory also functioned as the General or Departmental Laboratory for the Panama Canal Department, there being no Department Laboratory in this Department.

The Health Department of The Panama Canal operates an undertaking service. This service was used by the Graves Registration Service of the Panama Canal Department. The cemeteries are under the direction of the Chief Health Officer.

The Chief Health Officer of The Panama Canal is by Act of Congress of the United States also Health Officer of the terminal cities of Colon and Panama. The Health Officers of these cities are civil employees of The Panama Canal and on the staff of the Chief Health Officer. There is a well organized Health Office in each of the cities of Colon and Panama. In addition to the usual functions associated with a health office, street cleaning, garbage and trash disposal, housing and plumbing inspection, malaria, vermin and rodent control are also functions of the respective health offices.

CHIEF  
HEALTH OFFICER

ASSISTANT  
CHIEF HEALTH OFFICER

DIVISION OF HOSPITALS  
DISPENSARIES AND CHARITIES

DIVISION OF SANITATION  
DIVISION OF HYGIENE  
AND QUARANTINE  
AND IMMIGRATION

GORRAS HOSPITAL	COLON HOSP	FIELD SANITATION	HEALTH OFFICE PANAMA	DIST NURSING SERVICE	CRISTOBAL QUARANTINE
BOARD OF HEALTH LABORATORY	MARGARITA HOSP	NORTHERN DIST	SOUTHERN DIST	MATERNAL AND CHILD WELFARE	BALBOA QUARANTINE
COROZAL HOSPITAL FOR THE INSANE	PALO SECO LEPER COLONY	Pedro Miguel Sub District	HEALTH OFFICE CRISTOBAL - COLON	SCHOOL HEALTH SECTION	
DISPENSARIES	FIRST AID STATIONS	Panama Suburban			
Balboa	Pedro Miguel Locks	Sub District			
Ancon	Miraflores Locks				
Pedro Miguel	Gatun Locks	Ancon - Balboa			
Cerroboa	Gatun 3rd Locks	Sub District			
Gatun	Submarine Base				
Colon	Coco Solid	Coccoli			
Coccoli		Sub District			
Diablo Heights					
Margarita		Gamboa			
Chagres		Sub District			

The health of the cities of Colon and Panama during the World War II Period was excellent.

The foreign quarantine activities of the office of the Chief Health Officer are set forth in Chapter 15, Foreign Quarantine.

The Minister of Hygiene, Social Security and Public Works is in charge of all civil health activities in the Republic of Panama. A Director of Hygiene and Health function under the Minister. These officials cooperate with the Chief Health Officer relative to the civil health in the terminal cities of Colon and Panama. They function independently with regard to civil health activities in the remainder of the Republic but are always open to suggestions by the Chief Health Officer relative to health conditions throughout the country.

The office of the Director of Health of the Republic of Panama is organized along the lines of the office of the Chief Health Officer. There are sub-divisions of hospitals, with the exception of Santo Tomas Hospital and Amador Guerra Hospital, which function directly under the President of the Republic, of sanitation, of hygiene, and of venereal disease.

The civil health of the Republic of Panama was generally good during the World War II Period. There were marked increases in the annual rates per 100,000 for tuberculosis due to the crowded conditions resulting from dislocation of susceptibles who came to the terminal cities in response to urgent calls for laborers, and in the annual rates per 100,000 for the venereal diseases.

The visiting nurses and school nurses functioned exceptionally well but their numbers were limited.

The Health Departments of the Republics of Costa Rica, Nicaragua, Honduras, Salvador, Guatemala, Ecuador and Peru were all under the supervision of a Minister of Health and Hygiene and under the direction of a Director of Health, a Medical officer. The usual divisions of hospitals, sanitation, hygiene and quarantine were set up.

The health in general in these Republics was fair. Typhus fever was endemic in Guatemala and the mountainous portions of the other republics. Onchocerciasis was endemic in certain rather circumscribed areas in Guatemala. Carrions disease was endemic in the alta plana in Peru and Ecuador. The rates per 100,000 per annum for malaria were

high in Guatemala, Nicaragua, and Ecuador. Dysentery both amebic and bacillary was endemic in all the Central and South American Republics, and in the Panama Canal Department. The rates for the venereal diseases were high in Guatemala, Nicaragua, Salvador, Costa Rica and Ecuador. The water supplies in the civil communities with the exception of the terminal cities of Colon and Panama were almost universally non-potable.

## CHAPTER 21

### FOREIGN QUARANTINE

Foreign quarantine in the Panama Canal Department during the World War II Period was under the control of the Chief Health Officer of The Panama Canal for the Canal Zone and the terminal cities of Colon and Panama, and the Ministers of Health of the respective Republics lying within the territorial limits of the Panama Canal Department.

An officer of the United States Public Health Service was assigned to the staff of the Governor of The Panama Canal for duty with the Chief Health Officer, The Panama Canal.

Quarantine officers were established at Cristobal and Balboa. All ships were boarded by quarantine officers and pratique given after examination of passengers and crew. All airplanes except military aircraft entering the Canal Zone were passed for quarantine. All civilian military aircraft passengers with port of embarkation other than the Canal Zone or the Republic of Panama reported to the Quarantine Officer at Cristobal or Balboa for inspection.

All aircraft both military and civilian arriving at the Canal Zone Airports from ports of departure other than the Canal Zone or the Republic of Panama were sprayed with a concentrated solution of pyrethrum after departure from last foreign port and prior to landing in the Canal Zone until the Spring of 1943 when Freon-Aerosol Dispensers became available and were used in military planes.

The importation of dogs, except special hunting and racing breeds which had special certificates relative to immunization against rabies and certificates of health, was prohibited unless the dog was placed in quarantine for a period of six months from the date of arrival in the Canal Zone.

The Health Department, The Panama Canal, maintained a quarantine station at Balboa from 1 January 1940 to December 1941 when this station was taken over as an Internee Camp and a new Quarantine Station opened at Corozal, Canal Zone, Adjacent to the Panama Canal Hospital.

Seamen, foreign civilian employees awaiting repatriation and transient civilians hospitalized for quarantinable diseases, following release from hospital were held at this station while awaiting transportation.

The provisions of Section III, AR 40-210, paragraphs 4 and 6, AR 40-215 TB Med 114 and paragraph 5 AR 615-250, were strictly followed in this department.

The regulations governing quarantine of animals, plants, and their products contained in paragraph 5 AR 40-225, paragraph 28, WD Circular 453, Section IV, WD Circular 43, Section III, AAF Regulations 61-3, and paragraphs 8 and 9, WD Circular 335 were strictly conformed to.

Disinsectization of aircraft was practiced in accordance with the provisions of Section IV and Appendix I, AAF Regulations 61-3 following issuance of those regulations in August 1944.

A mimeograph letter setting forth all regulations governing foreign quarantine was published 12 June 1945 for the information and guidance of the personnel of the Panama Canal and all civilian personnel traveling by transportation under jurisdiction of the Army. A copy of this mimeograph letter is attached hereto as Appendix A.

All personnel arriving in this department from the United States or foreign countries, except Panama, who had cases of acute infectious or communicable diseases, were placed in working quarantine immediately upon debarkation. The period of working quarantine enforced was in accordance with the regulations of the United States Public Health Service and AR 40-210.

HEADQUARTERS PANAMA CANAL DEPARTMENT  
Office of the Department Commander

MIMEOGRAPH  
LETTER NO. 55  
AG 720.4-1

APO 834

12 June 1945

SUBJECT: Foreign Quarantine.

TO: CGs, Sixth AF, CAC, MF & SC;  
COS, all posts, camps and air bases;  
COS, 262d General Hospital & 368th Station Hospital.

1. General.

Foreign quarantine embraces those measures designed to prevent the introduction of disease or pests from one area to another, where such areas are not contiguous, are separated by the high seas or are under different national jurisdiction. It may pertain to man and the diseases of man; to animals including insects; the diseases of animals; or to plants and the diseases of plants.

2. Quarantine of Personnel.

In order to prevent the introduction of quarantinable and communicable disease of man from this Department into the United States, its Territories and Possessions, all persons traveling either by water or by airplane under the jurisdiction of the Army will be required to comply with the immunization requirements as set forth in Section III, AR 40-210, dated 25 April 1945 and TB Med 114, dated 9 November 1944, and will also be declared free from communicable disease and vermin infestation by proper inspection as outlined in par 5, AR 615-250, dated 24 July 1942.

3. Immunization Requirements.

a. Military personnel must have completed all immunizations as directed by TB Med 114. In accordance with paragraphs 4 and 6, AR 40-215, the commanding officer of each organization is responsible that all copies of Immunization Register and Other Medical Data (WD AGO Form 8-117) are properly maintained and that entries thereon are kept "up to date."

b. Civilian personnel traveling by transportation (surface water craft or aircraft) under the jurisdiction of the Army are required to be immunized as follows:

- (1) A successful smallpox vaccination within the past three (3) years. (Ref: Pars 8 c, 10 b (1), and 10 f, AR 40-210 and Par 4 a, TB Med 114).
- (2) An initial course of three (3) subcutaneous injections of triple typhoid vaccine at intervals of from 7 to 28 days each with revaccination with a stimulating dose of 0.5 c.c. of the triple typhoid vaccine annually. (Ref: Pars 8c, 10 b (2), 10 f, AR 40-210 and Par 4 b, TB Med 114).
- (3) Yellow fever vaccination is required only for those traveling to or through an endemic area. Footnote #8, TB Med 114, enumerates the involved areas as follows:  
"Yellow fever immunization is required for those stationed in or traveling to or through the endemic areas which are defined as follows: In the Eastern Hemisphere, that portion of Africa lying between latitude 18° south and the northern borders of French West Africa, French Equatorial Africa, and the Anglo-Egyptian Sudan, including the islands immediately adjacent thereto. In the Western Hemisphere, the mainland of South America lying between latitudes 13° north and 30° south, including the islands immediately adjacent, and Panama, including the Canal Zone. However, transit through the Panama Canal with brief sojourns within the terminal port cities or military posts within the Canal Zone will not be considered as travel through an endemic area. In order to comply with the quarantine regulations of certain countries, individuals traveling to these countries through the endemic areas as defined above must have been vaccinated not less than 10 days nor more than 4 years before entering an endemic area. The individual must carry an immunization register or certificate of immunity."  
In the case of dependents (of military personnel) whose final destination is Panama, Trinidad, Curacao, or Aruba and who will not traverse endemic yellow fever areas on the continent of South America, the requirement of the ten (10) day waiting period after immunization is not required. This same policy will be exercised in the case of all civilians traveling overseas by Army aircraft. (Ref: Ltr., OSG, ASF to CG, AAF, Subj "Immunization of Dependents of US Army Personnel and other Civilians," file SPMDR 720.3, dtd 26 May 1945, and indorsements thereto).

(4) Typhus fever inoculation is required for those who travel to or through endemic areas which are enumerated in Footnote #6, TB Med, as follows:  
Typhus fever immunization is required for personnel stationed in or traveling through Asia, Africa, Europe (including the British Isles), the mountainous regions of Central and South America (including Mexico, but excepting Panama), Alaska, the Southwest Pacific Area, and certain islands in the South Pacific (see POM).  
In highly endemic areas, stimulating doses should be given about 1 November and 1 February and additional doses whenever an unusual risk of exposure exists."  
This vaccination consists of two (2) subcutaneous injections of 1.0 c.c. of typhus vaccine at intervals of from 7 to 10 days. This immunization must be completed not less than 10 days prior to departure from this Department and travel orders or orders for leave or furlough will include a statement in the body of the orders that typhus vaccination has been completed and that the date of completion is not less than 10 days prior to departure from this Department. (Ref: Par 1b, Cir 31, Hq PCD, dtd 6 May 44). The stimulating dose of typhus vaccine consists of 1.0 c.c. and because the disease may occur at any time in this theater, the stimulating dose is administered every six months or in the presence of an epidemic. (Ref: Par 5, Sec IV, CP Bull No. 34, Hq PCD, dtd 29 Nov 44, Pars 8c, 10f, and 11a, AR 40-210 and Par 4f, TB Med 114).

(5) Tetanus toxoid inoculations are not required for Civilian passengers, however, they should be urged to avail themselves of the protection against tetanus.

c. Immunization Requirements for Children.

(1) Children over three (3) months of age are required to have smallpox vaccination with revaccination every three (3) years. (Ref: Par 10d (1), AR 40-210 and par 59e, PCD Reg, 1940).

(2) The requirement of triple typhoid vaccine for infants under one (1) year of age is waived. Proper dosage for children over one (1) year of age is proportioned to the weight of the child. As a guide, a 50 lb. child should receive 1/2 the adult dose. (Ref: Par 2b of Ltr. quoted in 3b (3) above).

(3) Yellow fever immunization of infants under one (1) year of age is not required. Children over one (1) year should be given dosage in proportion to their weight. (Ref: Par 2c of Ltr quoted in 3b (3) above).

Each civilian who is immunized at an Army medical installation will be furnished a copy of WD AGO Form 8-117, Immunization Register and Other Medical Data, accomplished in the manner prescribed for military personnel in AR 40-215, dtd 25 April 1945.

d. Military and civilian personnel of foreign countries who travel by surface vessel or airplane under Army jurisdiction will not be required to be immunized, except to smallpox routinely and to yellow fever in accordance with requirements of countries to or through which travel will occur, but should be advised of the advantages of immunization, including personal protection and relief from detention in quarantine in some instances. Such personnel may be immunized upon their request; quarantine restrictions enforced because of their failure to be immunized will not involve responsibility of the Army. (Ref: par 10f, AR 40-210, dated 25 Apr 45).

e. In very unusual and rare circumstances, the immunization requirements may be waived and travel permitted only when recommended by the surgeon and approved by the commanding officer at the point of departure, except that yellow fever immunization will not be waived unless requirements for it have been waived officially by countries to and through which travel will occur. Persons will not be accepted for transportation if in the opinion of the surgeon their presence would imperil the health of other personnel. (Ref: par 10f, AR 40-210, dtd 25 Apr 45).

#### 4. Physical Inspection Prior to Embarkation.

a. All persons authorized to travel on a surface vessel or airplane under Army jurisdiction will be physically inspected by a medical officer or duly certified and licensed physician of the Panama Canal Health Department within forty-eight (48) hours prior to the announced time of embarkation for the purpose of detection of communicable disease and vermin infestation. (Ref: Par 5, AR 615-250, dtd 24 July 1942).

(1) Military personnel who are being processed at a casual center will be inspected by the post surgeon or his commissioned Medical Corps representative.

(a) Military personnel on readjustment movements with primary and secondary syphilis, lymphogranuloma venereum, granuloma inguinale and undiagnosed penile lesions will be detained and treated prior to embarkation. Individuals with uncomplicated gonorrhea and those with an undiagnosed urethral discharge will be embarked. Whenever possible, treatment should be initiated prior to embarkation and continued if necessary while aboard ship. (Ref: Par 17a, RR 1-2, dtd 11 Apr 45). Medical officers conducting the

inspection will prepare a clearance certificate in triplicate, giving the place, date and hour of such an inspection and indicating the results thereof. This certificate will be in the form of an indorsement to an official roster or passenger list of the personnel examined. The original of the certificate will be attached to and made part of the official passenger list or roster, one copy will be retained at the issuing station and second copy will be given to transportation authorities. The certificate is to read substantially as follows: "All personnel listed on this certificate have been examined by the undersigned and found to be free from quarantinable disease (cholera, leprosy, smallpox, plague, epidemic typhus and yellow fever), vermin infestation, and communicable disease. The following named persons are infected with the venereal disease listed after their names:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\*Roster, Special Order, Passenger List-(Insert one)  
Immunization requirements of the War Department have  
been met or are in process of being completed with  
\*\*.

Signature Medical Corps."

\*\*\* No exceptions; The following exceptions as noted  
on reverse side-(Insert one) (Ref: Par 5 d, AR 615-  
250)

(2) Military personnel not processed in a casual center will comply with all the foregoing requirements whether traveling singly or in a unit. The unit or post surgeon of personnel concerned will furnish the health certificate as outlined in (1) above, in triplicate. The original is to be given to the individual inspected or to the officer or non-commissioned officer in charge, one copy is to be retained by issuing station and the second copy is to be furnished the transportation authorities.

(3) Civilian passengers of United States citizenship will be required to comply with the same immunization and health requirements as military personnel with the exception of tetanus toxoid inoculations. Any Panama Canal dispensary or Army dispensary surgeon will inspect each individual requesting such examination and will issue the required medical clearance certificate. The following form of certificate will be used.

CERTIFICATE

\_\_\_\_\_, C.Z.  
\_\_\_\_\_, 19  
\_\_\_\_\_, A.M.  
\_\_\_\_\_, P.M.

The persons named above have been examined by the undersigned and found to be free of quarantinable (cholera, leprosy, smallpox, plague, epidemic typhus and yellow fever), communicable disease and vermin infestation. Immunization requirements of the War Department

\*have been met.

\*are in the process of being completed.

\*Strike out line not applicable.

M.D.

(4) The port surgeon of the port concerned where embarkation is taking place, or air base surgeon when travel is to be initiated by airplane, will satisfy himself by checking the medical clearance certificates that all personnel embarked have met all immunization and health requirements. The port surgeon or air base surgeon will then issue a health clearance certificate to the transport commander or master of the vessel or to the pilot of the plane giving quarantine clearance for all personnel embarked. The form of the certificate and its distribution will be the same as in paragraph (1) above. This certificate will be used by transportation authorities to obtain speedy clearance at destination.

(5) In cases of emergency, when travel is performed by airplane and it was not feasible to obtain the necessary certificate from the unit or port surgeon concerned, the Surgeon, Panama Air Depot Dispensary, or his commissioned Medical Corps assistant will give the necessary medical clearance.

5. Quarantine of Animals, Plants, and their Products.

a. No living plant or animal or products of same will be imported to the United States, its Territories or Possessions by a surface vessel, airplane or by personnel under the jurisdiction of the Army, unless it is for scientific, educational or military purposes and a certificate has been secured in advance from the proper authorities of the country or territory into which importation is intended. Even though authorized, no animal will be transported unless certified by a qualified veterinarian to be free from disease, except as provided in b below. (Ref: Par 5, AR 40-225, dated 21 November 1944; Par 28, WD Circular #453, dated 29 November 1944; Section IV, WD Circular #43, dated 5 February 1945; Section III, AAF Regulations 61-3, dated 9 August 1944)

b. Pathogenic cultures or tissue or animals infected with pathogenic organisms when passed for importation will be packed or crated and transportation and care arranged for as outlined in paragraph 24, War Department Circular #453, 29 November 1944. Pathogenic tissues or cultures when shipped by mail will be collected and packed in accordance with postal and military regulations. (Ref: AR 40-310)

c. Commanding officers of all echelons with the technical advice of the appropriate surgeons are responsible for the enforcement of regulations and directives relative to foreign quarantine (par 3, AR 40-225). Therefore, each appointed customs inspecting officer will thoroughly acquaint himself with the prohibited and restricted items subject to quarantine as outlined in Paragraphs 8 and 9, War Department Circular #335, 1944 and Sections VI, VII and VIII, Circular #453, 1944.

d. Questionable material of any description should be referred to the appropriate surgeon for decision. In this connection each unit or port surgeon will periodically review the processing of baggage to assure himself that the inspecting officer is well acquainted with, and is interested in eliminating from the baggage, or informing proper authorities of the presence of any quarantinable items in the baggage inspected.

*Armed*

6. Disinsectization of Aircraft.

a. Disinsectization of aircraft is for the purpose of preventing the introduction and implantation of exotic insects in areas in which they do not already exist. Section IV and Appendix I, AAF Regulations 61-3, 9 August 1944, thoroughly deal with this subject and set up mechanics and principles involved in carrying out War Department requirements:

"C.

Type of Aircraft	Aerosol (Hold 2 min.)	Handspray (Hold 5 min.)
Single-Seat Planes	3 sec.	3cc.
B-17, B-25, B-26, C-47, etc.	15 sec.	10cc.
B-24, C-87, etc.	25 sec.	15cc.
B-29, C-54, etc.	40 sec.	25cc.

A watch with second hand will be used by all sprayers."

b. Study of insect risks and of civil requirements known at this time indicates that in the Panama Canal Department the following disinsectization of aircraft should be complied with:

- (1) Aircraft departing from the Panama Canal Department for the:
  - (a) United States
  - (b) Jamaica
  - (c) Trinidad
  - (d) Galapagos Islands

(2) Aircraft arriving from Trinidad or South America, immediately before departure from the Panama Canal Department.

c. Disinsectization will be done on all aircraft using aerosol insecticide or a suitable approved substitute as described in Appendix I, AAF Regulations 61-3, dated 9 August 1944.

d. When disinsectization is done before departure that fact will be indicated on the aircraft clearance (AAF Form #23) in the form of a certificate stating the date, time and place of spraying either in writing or by using a rubber stamp. It is to be signed by the officer-in-charge of the aircraft or his authorized representative. This certificate when submitted to the authorities upon landing at point of destination will be used to obtain disinsectization clearance and prevent needless repeating of spraying at point of landing in the United States.

BY COMMAND OF LIEUTENANT GENERAL BRETT:

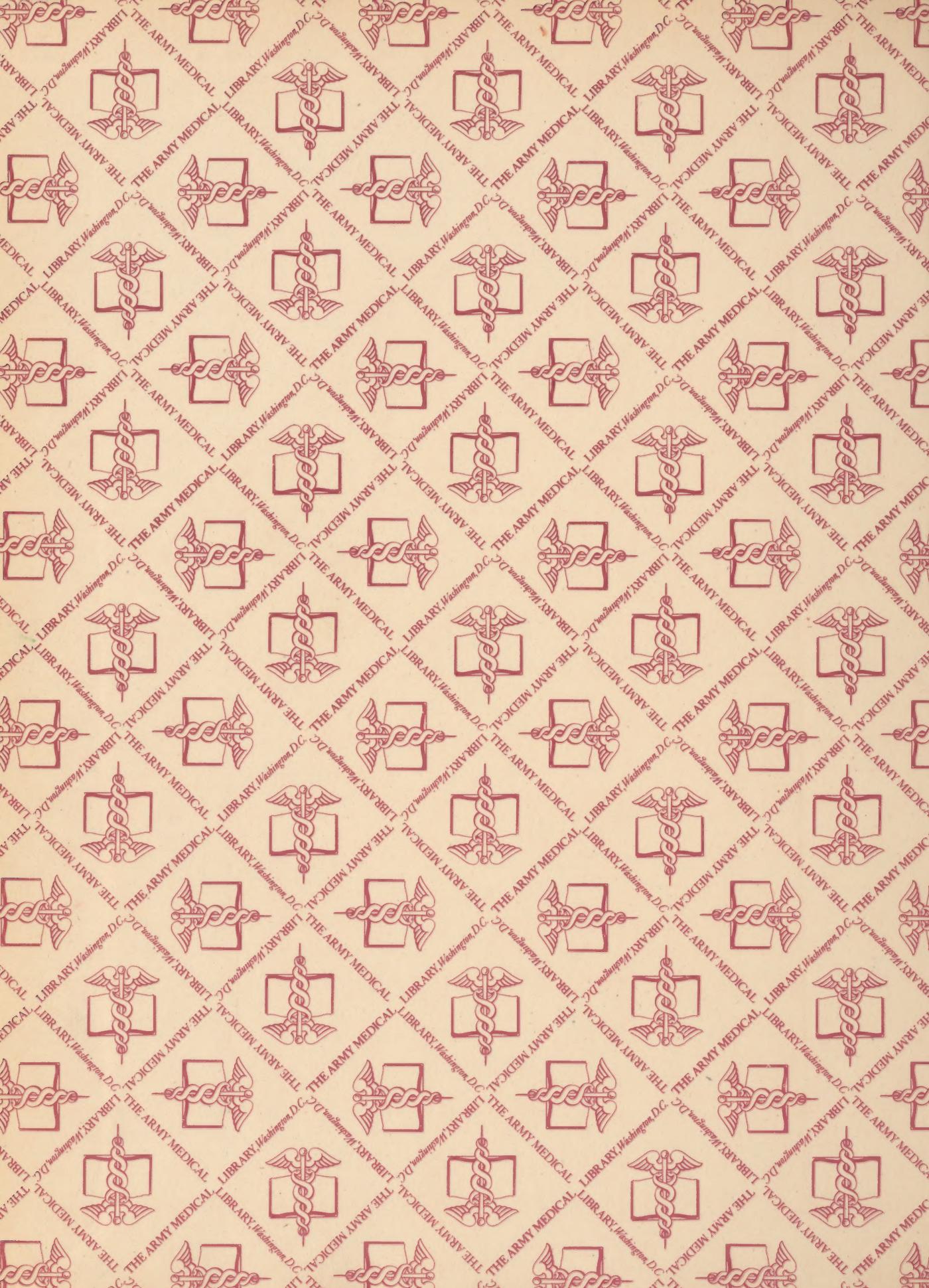
/s/ Hugh J. Deeney  
HUGH J. DEENEY  
Colonel, Adjutant General's Department  
Adjutant General

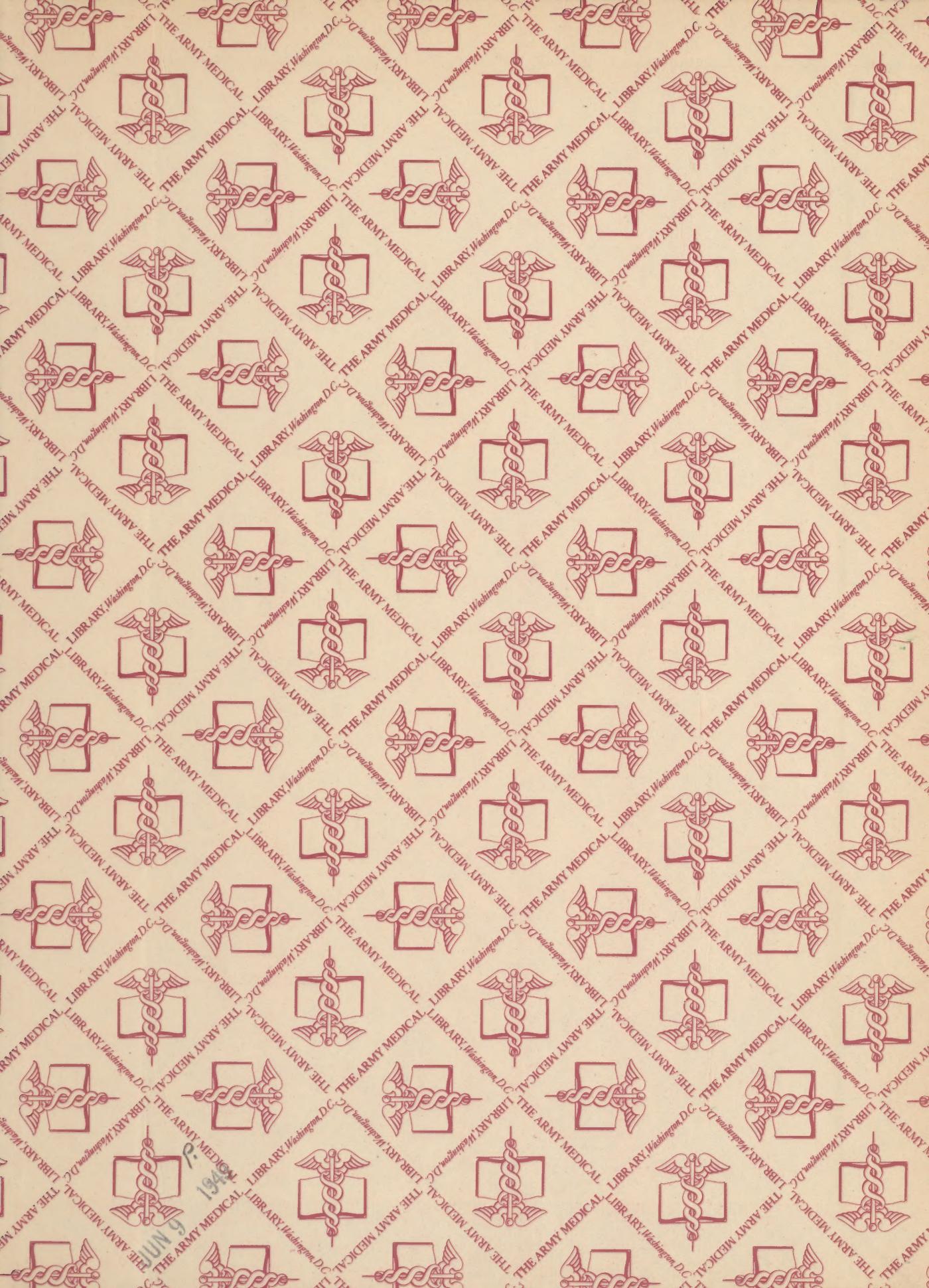
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